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Vol. 6 July 1955 No. 7

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METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

MALCOLM RIGBY, Editor

Vol. 6 JULY, 1955 No. 7

SPECIAL FEATURE IN THIS ISSUE

An Annotated Bibliography on Radar Cloud Physics

by
Wilhelm Nupen

(For complete table of contents see back cover)

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FOREWORD

Meteorological Abstracts and Bibliography is a monthly publication whose purpose is to bring to the attention of meteorologists current literature in their field and in related fields and to provide bibliographic information on various subjects, as interest demands.

Part I contains abstracts of current literature in the fields of meteorology, oceanography, etc., arranged according to the Universal Decimal Classification.

Part II of each issue comprises a special annotated bibliography of important references on a special subject. No attempt is made to prepare exhaustive bibliographies; instead, the aim is to include a representative cross section of the various aspects of a subject.

Bibliographies published in the successive issues were:

Vol. I, 1950

1. Atmos. Pollution	**2. Aerobiology**	**3. Cloud Physics**	**4. Hail**
5. Tornadoes	**6. Volcanic Dust**	**7. Climat. Changes**	**8. Thunderstorms**
9. Icing	**10. Acoust. Propagation**	**11. Evaporation**	

Vol. II, 1951

1. Extended Forecast.	**2. Long Range Forecast.**	**3. Soil Temp.**	**4. Constants, etc.**
5. Clim. of Near East	**6. Clim. of Middle East**	**7. Special Winds**	**8. Radar Storm Detect.**
9. Condensation Trails	**10. Clim. of N.E. Africa**	**11. Mountain Met.**	

Vol. III, 1952

1. Clim. of N.W. Africa	**2. Carbon Dioxide**	**3. Clim. of Argentina, etc.**	**4. Dew**
5. Objective Forecast.	**6. Stratus Forecast.**	**7. Urban Climatology**	**8. Clim. of C. Africa**
9. Visibility	**10. Glaze and Rime**	**11. Free Air Turbulence**	

Vol. IV, 1953

1. Turbulence Theory	**2. Turbulent Diffusion**	**3. Frost**	**4. Clim. of Australia, etc.**
5. High Level Winds	**6. Winds in Stratosphere**	**7. Jet Stream**	**8. Radiation Bioclim.**
9. Clim. of Pacific	**10. Auroras**	**11. Sferics**	

Vol. V, 1954

1. Oceanog. Met.	**2. Clim. of S.E. Asia**	**3. Auroral Physics**	**4. Tropopause**
5. Balloons	**6. Numerical Forecast.**	**7. Radiation Data**	**8. Vertical Motion**
9. Clim. of Arctic	**10. Industrial Met.**	**11. Wind Waves and Swell**	

Bibliographies published this year are:

1. **Bibliography of Bibliographies on Meteorology,** Vol. 6, No. 1, Jan. 1955
2. **Textbooks and Monographs Containing Subject Bibliographies,** Vol. 6, No. 2, Feb. 1955
3. **Storm Surges,** Vol. 6, No. 3, March 1955
4. **Ionospheric Propagation,** Vol. 6, No. 4, April 1955
5. **Photochemistry of Upper Atmosphere,** Vol 6, No. 5, May 1955
6. **Cloud Physics,** Vol. 6, No. 6, June 1955
7. **Radar Cloud Physics,** Vol. 6, No. 7, July 1955

Forthcoming bibliographies will be:

8. **Condensation Nuclei,** Vol. 6, No. 8, Aug. 1955

Other bibliographies in preparation are:

Actinometers	*Night Airglow*
Arctic Synoptic Meteorology	*Ocean-Atmosphere Energy Exchange*
Climate of the Arctic	*Ozone*
Cosmic Rays in the Atmosphere	*Singularities*
Fog Forecasting	*Snow Cover*
Indoor Climatology	*Synoptic Aerology*
Microwave Propagation	*Tropical Cyclones*

Part III contains a listing of the contents of those journals which are primarily meteorological. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes. In the December issue cumulative author, subject, geographical and journal indexes are published.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where the material may be found. The Union List of Serials (Gregory) is the source of most of the symbols used. In some cases, where no symbol has been assigned to a library, one will be devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DN-HO:	U. S. Navy Hydrographic Office Library, Suitland, Md.
DSG:	U. S. Army Medical Library, Washington, D. C.
DSI:	Smithsonian Institution Library, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.
GB-MO:	Great Britain, Meteorological Office Library, Harrow, England.
MH-BH:	Harvard University, Blue Hill Observatory (and American Meteorological Society) Library, Milton, Mass.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by charts.

Geographic locations are in the English form rather than the form used locally, for example, Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwise stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet according to the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months are abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Number (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus an entry will read as follows:

Meteorologische Rundschau, 2(5/6):146–151, May/June 1950.

This indicates that the article appeared in *Meteorologische Rundschau*, *Jahrgang* 2 (Vol. 2), *Heft* 5/6 (No. 5/6), *pages* 146–151, May/June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL MATERIAL

MAJOR GENERAL WORKS

COLLECTED WORKS

6.7–1 550.3(08)

†**Advances in Geophysics,** v. 2. ed. by H. E. Landsberg. N. Y. Academic Press, **1955.** 286 p. numerous figs. (incl. photos), bibliog. at end of each section. Contents: Marshall, J. S.; Hitschfeld, Walter and Gunn, K. L. S., **Advances in radar weather,** p. 1–56. Gringorten, Irving I., **Methods of objective weather forecasting,** p. 57–92. Pierson, Willard J., Jr., **Wind generated gravity waves,** p. 93–178. Kulp, J. Laurence, **Geological chronometry by radioactive methods,** p. 179–217. Benioff, Hugo, **Earthquake seismographs and associated instruments,** p. 219–275. (First four articles abstracted separately.) (For abstract on v. 1, 1952 *see* 4.4–10, April 1953, *MAB.*) **DLC**—Second volume of **Advances in Geophysics** keeps up the high standards set in Vol. 1 in respect to quality of material, organization, outlines, bibliographic citations and indexing of the entire volume. As can be seen from the titles, the first two papers constitute reviews of progress in two strictly meteorological fields, both of which have been advanced tremendously in recent years by the application of knowledge or technical developments in other fields (i.e., electronics and statistics, respectively); the third paper reviews recent advances in an allied field (oceanography or hydrography) which have been possible because of work in hydrodynamics, statistics and meteorology. The last two papers are on allied fields of geophysics—1) geochronometry by various radioactive methods, among them C^{14} which has aided in paleoclimatological studies and 2) seismological instrumentation, which has specific application to microseismic storm tracking. So the editor's policy of publishing papers on diversified fields has been continued in the hope of advancing meteorology. *Subject Headings:* **1. Advances in geophysics 2. Radar meteorology 3. Objective forecasting 4. Wind waves 5. Geochronometry 6. Microseismometry 7. Bibliographies. I. Landsberg, H. E.** (*ed.*).—*M.R.*

6.7–2 551.515.213:551.509.52(263.5,265)

*Chicago. University. Dept. of Meteorology, **Recent studies on tropical meteorology** Contract N6ori-20, Task Order 23, Final Report, Pt. 2, March **1953.** 6 papers, each paper renumbered. Contents: Hughes, Lawrence A., **On the low-level wind structure of tropical storms.** 10 p. 10 figs., table, 10 refs., eqs. Jordan, Elizabeth S., **An observational study of the upper wind circulation around tropical storms.** 9 p. 8 figs., 10 refs. Jordan, Charles L., **On the low-level structure of the typhoon eye.** 9 p. 6 figs., 7 refs. Colón, José A., **Study of hurricane tracks for forecasting purposes.** 10 p. 12 figs., 5 tables, 4 refs. Colón, José A., **Mean summer atmosphere of the rainy season over the western tropical Pacific Ocean.** 2 p. table, 2 refs. Jordan, Charles L., **Comparison between observed and geostrophic winds.** 8 p. 6 figs., 7 refs. **DWB**—In the first article, by L. A. Hughes, "A number of reconnaissance flights into large Pacific tropical cyclones are combined to obtain a generalized pattern of winds at low level (about 1000 feet) under both stationary and non-stationary conditions. Using these winds, a number of dependent computations are made including relative trajectories, divergence, vertical motion, rainfall, energy, and relative vorticity. . . ." In the second article, by E. S. Jordan, "All available rawin reports taken within the circulation of tropical storms are combined to obtain a generalized pattern of the upper wind circulation. The cyclonic circulation decreases rapidly with height and by 45,000 ft the circulation is anticyclonic beyond 3° latitude from the center. The relative vorticity in the upper troposphere was found to be negative and great enough in magnitude so that zero absolute vorticity is approached." In the third article, by C. L. Jordan, "Mean soundings are presented for

the typhoon eye and storm circulation, based principally on dropsonde data taken by recon naissance aircraft flying at the 700-millibar level. The vertical distribution of temperatur and moisture shown by these soundings, and visual observations made in the eye, are used a a basis for a qualitative discussion of the pattern of vertical motion in the eye." In the fourth article, José A. Colón analyzes the data on formation and motion of hurricanes in the Carib bean during 1887–1950 to show that there are marked long period variations in mean 5-yea totals as well as in 1 year total number of storms; above average 1887–95 and 1931–50, and below average from 1896–1930; and that the number of seasons with < average frequencies exceeds those with > average number. In Florida, October is the month with greatest risk other areas vary as shown in table. Groups of hurricanes forming in same area and following in quick succession are frequent in August, September and October. Probability of motion along each direction at each 5° square is shown on chart. Median speed of motion and per centage frequency of storms moving along a persistent track are also shown on charts for each month as an objective aid to effectiveness of persistence forecasting. In the fifth article Colón shows in tables and on a tephigram (not found in this copy) a standard cross section of the atmosphere for June–Sept. based on 1944–47 data for Kwajalein, Guam and Palau in the Central West Pacific, compared with Schacht's standard atmosphere of the Caribbean (Swan Island, San Juan and Miami). It is shown that the Western Pacific data differ only slightly from the Caribbean, though the former shows higher temperatures in the low levels lower temperature at high levels, and more moisture at all levels than does the Caribbean data. In the sixth paper, by Jordan, "A latitudinal profile of the mean geostrophic deviation is computed from surface and low level wind data and surface pressure gradients. The resulting geostrophic deviation is discussed in terms of the equations of motion." *Subject Headings:* **1. Tropical cyclone structure 2. Tropical cyclone forecasting 3. Hurricane statistics 4. Caribbean 5. West Pacific.**—*Authors' abstracts and M.R.*

6.7–3 551.51

Massachusetts Institute of Technology. Dept. of Meteorology, **Studies of the Atmospheric General Circulation.** Contract AF 19(122)-153, Final Report, Pt. 1, May 31 **1954.** Victor P. Starr, project director. 535 p. **DWB**—Mostly reprints of published articles Articles 1–4 are not products of the Contract. Articles 5–6, 43–44 are products of Contract W28-099-ac-406 with M.I.T. All articles are abstracted separately. Listing of the content of this Final Report will be found in *MAB*, 6(4), April 1955, Pt. 3, Contents, p. 555. *Subject Headings:* **1. Atmospheric circulation. I. Starr, Victor P.**

6.7–4 551.584.61(02):631.2:631.67 551.508.79:551.579.

†Searle, Sidney A. (*ed.*), **Plant climate and irrigation.** Chichester Press, **1954.** 154 p 28 figs., refs. **GB-MO**—In Ch. 1, Searle, S. A., **Plant climate,** is a brief summary of the effects of climate on plant growth, sources of climatic data, and plant protection. Ch. 2, Searle S. A., **Environmental factors in the glasshouse,** discusses optimum conditions of soil temperature, solar radiation, humidity and ventilation in a glasshouse. Ch. 3, Frampton, Francis R. **Growing in a microclimate.** Author discusses distribution and loss of heat in a glasshouse He favors the "high velocity low pressure hot water system," in which the temperatures of flow and return are so close that the 1¼–2″ pipes show no significant changes of heating power along their length. Lay-out, including the thermostat control, is illustrated. Ch. 4, Eastwell B. A. and Searle, S. A., **Measurement of soil moisture,** summarizes electrical methods of measuring soil moisture and their use in irrigation control. Searle describes the commercial soil moisture tensiometer—a porous pot connected by a copper tube to a vacuum gage. Ch. 5 Searle, S. A., **The calculation of crop water requirement,** shows the method of drawing up a "water balance sheet" for a green crop, and of assessing the factors of irrigation. Ch. 6 Salter, P. J., **The effects of different water regimes on the growth and yield of tomatoes** is a long, well documented (110 refs.) study of the effect of different water regimes on root development, growth and yield of tomatoes and on the soil. Ch. 7, Searle, S. A., **Application to commercial growing.** Appendix, Penman, H. L., **Physics of irrigation control,** is a summary of his paper discussing the moisture balance of water surface and a crop. *Subject Headings* **1. Greenhouse climates 2. Greenhouse irrigation 3. Soil moisture balance 4. Soil moisture instruments 5. Tomato culture 6. Textbooks.**—*C.E.P.B.*

TEXTBOOKS AND POPULAR SCIENCE BOOKS

6.7–5 551.5(09)

†Schneider-Carius, Karl, **Wetterkunde. Wetterforschung. Geschichte ihrer Probleme nd Erkenntnisse in Dokumenten aus drei Jahrtausenden.** [Meteorology. Weather research. History of its problems and concepts in documents through 3000 years.] Freiburg, Munich, Karl Alber, **1955.** 423 p. figs., tables, refs. (by chapter), p. 356–367. Bibliography, . 368–398. Biographical data (on meteorologists), p. 399–414. *Orbis Academicus*, Freiburg. **)LC**—An excellent reference work and source book for anyone interested in the history of neteorology and its various branches, from the earliest days to 1953, inclusive. It would be mpossible to list the numerous specific subjects that are treated chronologically in each of the 5 sections (arranged under 5 major chapter headings). The textual material consists mainly n a series of synopses of developments in each field, followed or interspersed with quotations rom the original sources, of which there are over 400, some a page or more in length, and all unfortunately) translated into German. Not much illustrative material is reproduced, but itations are numerous and accurate and lead one to the best of the world's meteorological terature since publication began. There are 3 separate lists of references: first a list of ources numbered consecutively by chapters; secondly a complete bibliography of nearly 000 references, including original titles, etc., arranged chronologically in each of 23 headings: . History of Meteorology, 2. Textbooks and 3. Collected Works, 4. Structure and composition f atmosphere, 5. Atmospheric electricity, 6. Optics, 7. Radiation, 8. Heat exchange, 9. Weather lements, 10. Thermodynamics, 11. Hydrologic cycle, 12. Dynamic meteorology, 13. Micro-neteorology, 14. Advective processes, 15. Atmospheric tides, waves and oscillations, 16. General nd local circulation, 17. Small scale weather, 18. Large scale weather, 19. Air masses and rontal theory, 20. Forecast methods, 21. Climatology, 22. Grosswetter and 23. Energetics, nd third a biographical register of about 320 authors, arranged alphabetically, and with brief otes as to birth, death, position and main contributions. Then an author index and finally subject index of over 500 subjects. One might note that there is not one single equation n the book, that only 2 or 3 of the authors mentioned were Russian, that French, American nd British authors are placed in proper perspective, and that German authors, naturally, redominate. *Subject Heading:* **1. History of meteorology.**—*M.R.*

6.7–6 551.5(04)

Krick, Irving P. and Fleming, Roscoe, **Sun, sea and sky. Weather in our world and in ur lives.** Philadelphia, Lippincott, **1954.** 248 p. diagrs., photos. **DLC**—The most recent dvances in practical meteorology are vividly described for the layman in the several chapters f this new book about the weather. Cloud seeding, the jet stream, industrial meteorology, imatic changes, air pollution, constant level balloons the "George Committee" report on **Veather is the nation's business,** the part played by the Caltech meteorologists in discovering he jet stream, in advancing the science of long range forecasting, and, incidentally, in setting he date for the invasion of Europe (D-Day) are all treated in the self-effacing style for which he senior author is famous. The 6 basic weather types of KRICK are illustrated by composite, frontal charts for North America, and are described in the chapter on **Tools of the eatherman's trade.** The illustrations are excellent, being well-chosen and timely. *Subject leadings:* **1. Popular meteorology 2. Industrial meteorology 3. Textbooks.**—*M.R.*

6.7–7 551.5(02)

Bush, George Leonard and Thompson, Will S. (*Kent State Univ., Ohio*), **New senior cience.** N. Y., American Book Co., **1954.** 642 p. numerous illus. (incl. many photos), efs. **Weather,** p. 441–468. 3 refs. **DWB**—In this attractive modern text for senior science udents in high schools, Ch. 9 (p. 441–468) entitled **How's the weather today?** deals with ractical aspects of weather and climate. Causes are treated briefly, but weather observations, struments, forecasts, air masses and fronts, lightning, weather lore, etc. are treated more lly with many illustrations. In the next chapter, **Home construction,** the effects of wind, ollution, sun, etc. on choosing the site and building a home are mentioned. Other chapters ealing with weather are those on **Soil conservation, Energy** (p. 293–297), **Communication nd travel,** and **Healthful living** (p. 621–628). *Subject Headings:* **1. Elementary meteorology Science textbooks.**—*M.R.*

6.7–8 536.5(02)

†Gordov, A. N.; Arzhanov, A. S. and Bilyk, V. IA., **Metody izmereniia temperatur v promyshlennosti.** [Methods of temperature measurement in industry.] Moscow, Metallurgisdat, **1952.** 432 p. 171 figs., 16+8 tables, 89 refs., eqs. **DLC**—A highly technical text on thermometry from every possible point of view: 1) concept of measurement of error of random errors, of sampling errors and errors in computation, etc.; 2) temperature scales 3) theory of temperature gradient and convective or radiative heat exchange; 4) resistance thermometers and their calibration; 5) liquid-in-glass; 6) manometric; 7) thermoelectric 8) optical and radiation; 9) miscellaneous methods of temperature measurement. Extensive bibliography of native literature on above fields is appended. Fully illustrated with nomograms, etc. *Subject Headings:* **1. Thermometry 2. Industrial thermometers 3. Heat exchange theory 4. Textbooks.**—*M.R.*

6.7–9 551.582

§†*Alisov, Boris Pavlovich, **Die Klimate der Erde (Ohne das Gebiet der UdSSR).** [Climate of the world, excluding the U.S.S.R.] Berlin, Deutscher Verlag, **1954.** 277 p. 99 figs. tables, bibliog. p. 270–277 (p. 276–277 are additional refs. to the 1950 Russian edition). **DLC** German translation of his **Klimaticheskie oblasti zarubezhnykh stran.** Moscow, Gos. Izdat. Geog. Lit., **1950.** 350 p. (for abstracts of the Russian edition *see* 2.10–155 and 3C–1, Oct. 1951 and March 1952, *MAB*). **DLC**—The first chapter of this excellent translation of Alisov's work, deals with general climatic zones, regions or types, and subsequent chapters with the synoptic and statistical aspects of the climate of Europe, Asia, Africa, Australia, South America, North and Central America and the Atlantic, Indian, Pacific, Arctic and Antarctic oceans. The bibliography and climatic tables for continents and oceans, as well as the synoptic charts and mean monthly charts are helpful. *Subject Headings:* **1. Climatology of earth 2. Synoptic climatology 3. Europe 4. Asia 5. Africa 6. America 7. Oceans 8. Arctic 9. Textbooks. I. Piotter, Dorothea** (*trans.*) **II. Reinhard, Heinrich** (*sr. ed. of trans.*)—*M.R.*

6.7–10 551.501.7(02)

†Kalinovskiĭ, Aleksandr Boleslavovich and Pinus, N. Z., **Aerologiia; metody aerologicheskikh nabliudeniĭ.** [Aerology; methods of aerological observations.] Leningrad, Gidrometeorologicheskoe Izd-vo, **1951.** 452 p. 245 figs. (incl. photos), tables, foot-refs., eqs. 164 refs., p. 423–428. **DLC**—A unique textbook for students intending to pursue practical hydrometeorological or aerological work. The various chapters consist of I. History and development, especially in U.S.S.R.; II. Pilot balloon observations; III. Meteorograph and its calibration, accuracy and corrections; IV. Kite, captive, and manned balloon observations VI. Airplane soundings; VII. Computations of meteorograph records; VIII. Radiosondes (various types described in detail and compared); IX. Radio-location applied to soundings X. Measurement of vertical currents; XI. Cloud and cloud physics measurements; XII. Rocket research; XIII. Publication of aerological "yearbooks" or summaries and machine methods of computation (80 column IBM-type cards and punchers, sorters and tabulator illustrated) The detailed theory that enters into each method of observation or instrument use; calculation of data, etc., and actual comparative values, accuracy of instrument elements, design and construction of instruments and photographs of equipment are included. The bibliography of 164 references arranged by chapters consists mainly of Russian sources, but a dozen or more German, U. S. or British references are cited. Material as recent as 1950 is included. Chapter on rockets gives comparative data for V-2 and Wac-Corporal Rocket flights and standard atmospheric data to 100 km height. Chapter on radiolocation includes brief mention of radar storm detection methods. *Subject Headings:* **1. Upper air observation techniques 2. Machine methods of aerological computation 3. Upper atmosphere instruments 4. Radiosondes 5. Textbooks.**—*M.R.*

6.7–11 551.46(02)

†Snezhinskiĭ, V. A., **Prakticheskaia okeanografiia (raboty v otkrytom more).** [Practical oceanography. Work in the open sea.] 2nd rev. ed. Leningrad, Gidrometizdat., **1954** 670 p. 39 tables, 377 figs. (incl. photos), ports., 158 refs. **DLC**—The second edition of this unique text contains 70 pages more text than the first, but has one less chapter (16 instead of

7) and is organized into three major parts instead of 6. These are: I. General (history, planning and preparation for expeditions, observations and their compilation, instruments and their correction, calibration, etc.), II. Deep sea measurements and III. Observations near sea surface (tide and coastal observations, currents, waves, temperature observations, salinity, and optical measurements). The chapter on energy exchange and evaporation has been omitted. References cover literature through 1952. All manner of oceanographic and hydrographic instruments, equipment and their use are discussed and illustrated. *Subject Headings:* **1. Oceanographic expeditions 2. Oceanographic equipment 3. Textbooks 4. Russian oceanography.**—*M.R.*

6.7–12 551.521:523(02)

†Kourganoff, V. and Busbridge, I. W., **Basic methods in transfer problems. Radiative equilibrium and neutron diffusion.** Oxford, Clarendon Press, **1952.** 281 p. numerous figs., tables, bibliog. p. 272–277, eqs. *International Series of Monographs on Physics*, Oxford. **DWB**—A systematic textbook on solution of problems connected with transfer of radiation in the atmospheres of the sun, stars, nebulae and galaxies. One actual problem is treated throughout the book, the non-grey case of Milne, involving use of all the mathematical tools and theory, rather than presenting the theory and forcing the student to figure out for himself how to solve actual problems. A majority of the references in the extensive bibliography are from Russian sources. The book complements CHANDRASEKHAR's 1950 text, rather than covering the same ground (*see item* 4.9–2, Sept. 1953, *MAB*). *Subject Headings:* **1. Astrophysics 2. Radiative transfer 3. Planetary atmospheres 4. Textbooks.**—*M.R.*

REVIEW ARTICLES AND MONOGRAPHS

See also: **Bulletin d'Information,** 6.7–54.

6.7–13 628(54) 551.573 551.579

*India. Central Board of Irrigation, **Annual report (Technical), 1949, Part 1.** Issued by the Board, **1954.** 309 p. figs., tables, foot-refs, bibliogs. Foreword signed 1951. Its *Publication*, No. 49. **DWB**—An elaborate and systematically organized report dealing with all aspects of the water supply and irrigation problem in India, Burma and Ceylon. Rain runoff, floods, ground water, soil erosion, soil moisture, artificial rainfall (p. 130), channel and engineering problems are discussed in separate sections and complete data in tabular and graphic form are included. On p. 107–111 is found an exhaustive treatment of evaporative losses from free water surfaces based on a coordinated research program recommended in 1946 and begun in May 1948. The effect of size of pan on evaporation is shown for May–Nov. 1948 in graphs and tables. Other research and investigations are reported. *Subject Headings:* **1. Rainfall runoff investigation 2. Evaporative water loss investigation 3. India. I. Malhotra, S. L.** (*ed.*).—*M.R.*

6.7–14 551.594.1

*Schilling, G. F. and Childress, P. L., **Summary of atmospheric electrical data at selected land and sea stations 1951–1953.** California. Univ. Institute of Geophysics, Contract AF 19(122)-254, Scientific Report, No. 8, Nov. 30, **1954.** 344 p. 4 maps, diagrs., tables (p. 19–325), 9 refs. **DWB**—The extensive data (in tabular and graphic form) of measurements of potential gradient, atmospheric conductivity and air-earth current density from 24 stations, from sea level to 4000 m in Austria, California, Hawaii and four other Pacific islands from May 1951 to Dec. 1953 are presented and discussed. Charts show location of stations; sites of each as well as instruments used are described in detail. Diurnal variations are shown in graphic form with effects of elevation and geographical location evident from arrangement of graphs in orderly sequence. *Subject Headings:* **1. Atmospheric electricity data 2. Atmospheric electricity networks 3. California 4. Austria 5. Hawaii 6. Pacific Islands.**—*M.R.*

6.7–15 551.556:551.311.31

§*†Petrov, Mikhail Platonovich, **Podvizhnye peski pustyn' Soiuza SSSR i bor'ba s nimi.** [Moving sands of U.S.S.R. deserts and the struggle with them.] Ed. by T. F. Iakubov.

Moscow, Gos. Izdat. Geograficheskoĭ literatury, **1950.** 454 p. 132 figs., 34 tables, 227 ref
Common geographical and subject index p. 429–450. Price: 13 Rub. **DLC**—The history
attempts to control sand, and the formation of sandy regions between the Caspian and Chin
are discussed and the location of each is shown on a large detailed chart. Each separat
region is described and then (Ch. IV) the physics of blowing or drifting sand treated quant
tatively (p. 98–132). Humidity (soil moisture and precipitation) conditions are discusse
(p. 154–166). Aerodynamic factors in formation and movement of dunes in nature, wit
vegetative strips and with mechanical strips (snow fence type) are treated in Ch. IV an
subsequent chapters. Particle size of various sands and chemical and geological compositio
are also treated. Information on meteorological elements in connection with moving sands i
the deserts of Middle Asia, South Kazakhstan, the Caspian Region and Azerbaidzhan ASS
is confined to results of studies of winds in Middle Asia conducted in 1931–1932 by S. Zac
zerskii (showing that winds of 5 m/sec speed and more make up only 11.3% of the tot
amount (p. 104) and that precipitation in the deserts is distributed irregularly during the yea
although there is a rainless (May–Sept.) and rainy (Oct.–March) period with two maximum
of precipitation in Jan. and in March (p. 155).) *Subject Headings:* **1. Sand drifting 2. Dese
reclamation 3. Textbooks 4. Central Asia, U.S.S.R.**—*M.R. and A.M.P.*

6.7–16 550.3

†Hardtwig, Erwin, **Probleme des Erdmagnetismus.** [Problems of geomagnetism.
Forschungen und Fortschritte, 27(4):97–103, Oct. **1953.** 33 refs. **DLC**—Short period ge
magnetic variations are understood but not the permanent "dipole" field or the secular varia
tion, which is due to slow precession of the axis of a field the moment of which is constan
The residuary ("non-dipole") field changes more rapidly. The intersection of the 0° isogon
with equator has moved steadily West from central Africa, by 90° since 1450, but the easter
intersection has moved only 30–40°, irregularly. Declination shown by remanent magnetis
in rocks varied from 28°E–38°W since 15,000 B.C. but on the whole, in geological times
coincided with rotation axis. Theories of permanent magnetism are examined; the earth
rotational mass (Blackett) seems the most promising source. The secular change is a
tributed to convective movements in earth's interior, which may also be a cause of climati
changes. A valuable summary. *Subject Heading:* **1. Terrestrial magnetism.**—*C.E.P.B.*

6.7–17 53

†Powell, Ralph W. (*National Physical Lab., Teddington*), **Heat.** *Physical Society
London, Reports on Progress in Physics*, 3:143–174, **1936.** pub. **1937,** reprinted **1952.**
tables, refs. after each section. **DLC**—Literature review on temperature measurement
colorimetry, conduction, radiation, convection, evaporation, hygrometry and dilatatio
covering all fields of applied physics. The meteorologist will be interested in items on therm
couples; effect of air bubbles on the specific heat of water; thermal conductivity of water vapo
emissivity of water; ice and hoarfrost; convection experiments; evaporation from limite
areas; exact hygrometric measurements, especially at low temperatures, etc. *Subject Heading*
1. Heat 2. Temperature measurements 3. Convection 4. Evaporation.—*A.A.*

6.7–18 551.577.2(54

*Krishna Rao, P. R., **Rainfall of Madras State with special reference to Tamilnad an
Rayalaseema.** *India. Meteorological Dept., Memoirs*, 30(1), **1953.** 61 p. 16 tables, 6 figs
7 refs. **DWB**—The rainfall of four sub-divisions of Madras State for the 77 year perio
1875–1951 and the district rainfall of Tamilnad and Rayalaseema for the 82 year perio
1870–1951 have been studied. Tables of sub-divisional rainfall and its percentage departure
and the percentage departures of rainfall of the districts of Tamilnad and Rayalaseema hav
been given. The abnormalities have been classified under different categories and the numbe
and frequency of years of slight, moderate and severe drought, the mean deviation (percentage
of the rainfall and the extreme abnormalities have been analyzed and discussed. A measur
of "Liability to drought" has been introduced and the liability to drought of the four sub
divisions and of the districts of Tamilnad and Rayalaseema have been compared. The chie
features of the northeast monsoon rainfall of Tamilnad, specially its distribution and i
relation to cyclonic storms and depressions affecting the Tamilnad Coast, have been discusse

Association of the northeast monsoon rainfall of Tamilnad with the contemporary southwest monsoon rainfall and of the northeast monsoon rainfall of the other sub-divisions has been examined. *Subject Headings:* **1. Rainfall probability 2. Drought frequency 3. Monsoon rains 4. Madras, India 5. Tamilnad, India.**—*Author's abstract.*

GENERAL GEOPHYSICS AND METEOROLOGY

See also: **Meteorology** (Schneider-Carius), 6.7–5; **Sun, sea and sky** (Krick, Fleming), 6.7–6; **New senior science** (Bush, Thompson), 6.7–7; **Intern. look at earth** (Ewing), 6.7–19; **Intern. Geophys. Year** (Chapman), 6.7–20; **Geophysics and warfare** (Landsberg), 6.7–25; **Earth's magnetic field** (Eady), 6.7–28; **Travelers Weather Research Center** (De Witt), 6.7–48; **East African Met. Dept.**, 6.7–49; **German Federal Met. Service** (Schmitt), 6.7–52; **Annual report (WMO)**, 6.7–57; **On the WMO**, 6.7–58; **WMO in world met.** (Reichelderfer), 6.7–59; **Oceanogr. conference**, 6.7–65; **Met-gy, climat-gy . . . in USSR** (6.7–69); **Weather course** (Gilchrist), 6.7–71; **Meteorology** (Merewether), 6.7–72; **What is met-gy** (Malone), 6.7–73; Prof. L. Prandtl (Relf), 6.7–81; **Flight planning** (Bellamy), 6.7–91; **Jet transport operation** (Kelly, Kaster), 6.7–92; **Comet flight** (Perry), 6.7–93; **Applied met-gy** (Dilloway), 6.7–95; **Weather is our business** (Smith), 6.7–101; **Agric. met.** (Burgos), 6.7–102.

GENERAL GEOPHYSICS

See also: **Advances in Geophysics**, 6.7–1; **Geophysical research** (Landsberg), 6.7–22; **Bulletin d'Information**, 6.7–54.

6.7–19 55:06 551.5:06

Ewing, Ann, **International look at earth.** *Science News Letter*, 67(3):42–43, Jan. 15, **1955.** photo. **DLC**—General outline of plans for the forthcoming International Geophysical Year, briefly discussing the international participation, arrangement of special stations, meteorological, auroral, electrical, ionospheric, magnetic and solar observations, rocket research, and other details. *Subject Headings:* **1. International Geophysical Year, 1957–1958 2. International Geophysical Year program.**—*G.T.*

6.7–20 550.3:06 551.5:06

Chapman, Sydney, **The International Geophysical Year, 1957–58.** *Nature*, London, 175(4445):55–56, Jan. 8, **1955. DWB**—Description of the organization and scope of the "Year" (July 1, 1957–Dec. 31, 1958). An account is given of the meeting of the Special Committee in Rome Sept. 30–Oct. 4, 1954. *Subject Heading:* **1. International Geophysical Year, 1957–1958.**—*C.E.P.B.*

6.7–21 550.3(98,99) 551.5:06

Berkner, L. V., **International scientific action: the International Geophysical Year 1957–58.** *Science*, 119(3096):569–575, April 30, **1954.** ref. **DLC**—As a vice-chairman of the Special Committee on the International Geophysical Year, the author remarks on the importance and development of geophysics and the aims and programs of the International Geophysical Year 1957–58. The WMO-IUGG program for general circulation, the CSAGI programs in magnetic, auroral and airglow observation, the cosmic-ray observation projects, the programs in glaciology and oceanography and the planned Antarctic expeditions are among the projected activities reviewed. *Subject Headings:* **1. International Geophysical Year, 1957–58 2. Geophysical research.**—*G.T.*

6.7–22 550.3:35

Landsberg, Helmut E. (*Air Force Cambridge Res. Center*), **Geophysical research.** *Air University Quarterly Review*, 6(1):63–73, Spring **1953.** 6 figs. **DWB**—A detailed review of the numerous activities of the Geophysical Research Directorate (GRD) of the Air Force in the field of atmospheric and hydrospheric research and the applications some of this research could have on military or air operations. The observatory at Sacramento Peak, N. M.,

Fletcher's Ice Island (T-3) near the North Pole, studies of the general circulation by hydrodynamic analogs (rotating dishpan experiment), "Moby Dick" balloons (constant level), the Sierra Wave Project and Numerical Prediction of Weather Patterns are among the projects mentioned as being conducted or participated in by GRD. *Subject Headings:* **1. Geophysical research 2. Military operations 3. U. S. Air Force. Cambridge Research Center. Geophysics Research Directorate.**—*M.R.*

6.7–23 551.311.12

Körner, H., **Gletschermechanik und Gletscherbewegung.** [Glacier mechanics and glacier movement.] *Zeitschrift für Gletscherkunde und Glazialgeologie*, 3(1):1–17, Dec. **1954.** 20 figs. German and English summaries p. 17. **DLC**—The kinematic theory of S. FINSTERWALDER for the movement of glaciers is first considered and found to be too general. The viscosity theory of LAGALLY and the recent plasticity theory of OROWAN and NYE are considered to represent two extreme conditions, which can apply in different parts of the same glacier, though in thin Alpine glaciers viscosity flow predominates. *Subject Heading:* **1. Glacier mechanics.**—*C.E.P.B.*

6.7–24 551.311.17(988)

Bauer, Albert, **The balance of the Greenland ice sheet.** *Journal of Glaciology*, 2(17): 456–462, April **1955.** 4 figs., 11 refs. English and French summaries p. 456. **DWB**—The mean height of the inland ice sheet is 2135 m. The mean firn line is at 1390 m. Discharge from ice sheet as icebergs is estimated as 215 km³ of water per year and the ice cap suffers a net loss of about 100 km³ water a year. *Subject Headings:* **1. Greenland ice cap.**—*C.E.P.B.*

6.7–25 551.5:35 550.3:35

Landsberg, Helmut E., **Geophysics and warfare.** *U. S. Research and Development Coordinating Committee on General Sciences, CGS* 202/1 (RDB 142/1 rev.), March **1954.** 68 p. 16 figs. (photos), 23 refs. "First version of the pamphlet prepared in 1948." **DWB**—A review of recent advances in the applications of various discoveries and theories in the field of geophysics, including physics of the earth—oceanography and meteorology—to military problems and needs. The section on meteorology is concerned with the importance and application in warfare of long and short range forecasting, weather control such as the production of artificial precipitation, atmospheric electricity phenomena in aviation, upper atmosphere and atmospheric transmissions. The discussion on oceanography deals with winds, drifts and currents, waves and swells and oceanographic forecasting, and the physical, chemical and biological properties of the oceans. In addition, the role of hydrology, terrestrial magnetism and electricity, geodesy, cartography, seismology, volcanology, soil mechanics and geology in military operations is reviewed. *Subject Headings:* **1. Military meteorology 2. Military geophysics 3. Military oceanography.**—*I.L.D.*

6.7–26 550.3:37

†Bartels, Julius, **Geophysik.** [Geophysics.] Heidelberg, Carl Winter, Universitätsverlag, **1944.** 197 p. 154 figs., bibliog. p. 169–178. *Studienführer, Heidelberg, Gruppe III*, v. 7. **DLC**—A nontechnical course in geophysics with information as to schools and institutes in Germany, Austria and Czechoslovakia which teach courses in geophysics or meteorology, and a quite exhaustive bibliography of literature on various phases of the subject. The course follows the scheme of the U.D.C. system for Geophysics (55). The chapters cover 1) Geophysics in general, 2) General structure, 3) Mechanics and thermal properties of earth, 4) Mechanics and thermodynamics of hydrosphere and atmosphere, 5) Electrical and magnetic phenomena—ionosphere, 6) Optical phenomena—radiation, 7) Colloidal, molecular and atomic, and radioactive phenomena, 8) Applied geophysics, 9) History of geophysics, 10) Research techniques—examples, 11) Teaching of geophysics in various faculties and 12) Literature sources.—*Subject Headings:* **1. Geophysics 2. Teaching of geophysics.**—*M.R.*

6.7–27 523.75:551.510.535(08)

Ferraro, V. C. A., **Geophysical aspects of solar flares.** *Nature*, London, 175(4449): 242–244, Feb. 5, **1955.** **DWB**—Summary of Geophysical Discussion at Royal Astronomical

Society on Nov. 26, 1954. H. W. NEWTON described effects of solar electromagnetic and particle radiation. J. S. HEY described distribution of solar flares across disc with associated radio bursts on 4.1 m. M. A. ELLISON dealt with the flash of UV radiation generated by a flare and sudden ionosphere disturbances. He attributed crochet currents to increased conductivity and an independent current system at base of D-layer, about 60–70 km. K. WEEKES discussed distribution of extra ionization during a solar flare, finding the greater part in 95–100 km with independent ionization near 70 km. H. ELLIOTT discussed increases of cosmic rays during intense solar flares. *Subject Headings:* **1. Solar flares 2. Ionospheric disturbances 3. Symposia. I. Newton, H. W. II. Hey, J. S. III. Ellison, M. A. IV. Weekes, K. V. Elliott, H.**—*C.E.P.B.*

6.7–28 550 551 551.5:061.2/3(08)

Eady, E. T., **The earth's magnetic field and numerical weather forecasting.** *Nature*, London, 175(4458):626–627, April 9, **1955. DWB**—Summary of discussion on **"Hydrodynamical processes in meteorology and geophysics"** by Royal Astronomical and Royal Meteorological Societies, Feb. 25, 1955. R. HIDE described experiments with water between two rotating cylinders at different temperatures. At a critical rotation rate a "jet stream" wave pattern develops. J. S. SAWYER discussed numerical weather forecasting. H. CHARNOCK showed a film of experiments simulating wind-driven ocean currents. T. V. DAVIES gave a theoretical expression for HIDE's wave pattern. E. T. EADY discussed turbulent transfer in rotating convective fluids, convection in the earth's core and a mechanism for maintaining earth's magnetic field. *Subject Headings:* **1. Symposia 2. Geophysics 3. Numerical forecasting 4. Jet stream. I. Hide, R. II. Sawyer, J. S. III. Charnock, H. IV. Davies, T. V.**—*C.E.P.B.*

6.7–29 536.25

Priestley, C. H. B., **Vertical heat transfer from impressed temperature fluctuations.** *Australian Journal of Physics*, 7(1):202–209, March **1954.** 2 figs., 5 refs., 21 eqs. **MH-BH**—The ability of buoyant elements to carry heat upwards through a stably stratified fluid depends on their rate of mixing and hence on their size. The largest and smallest elements are both relatively ineffective and there exists an optimum intermediate size yielding a maximum value of the buoyant heat flux for a given intensity of temperature disturbance. For a layer or uniform unstable stratification the heat flux increases progressively with size of element and there is no theoretical upper limit apart from that set by the depth of the unstable layer. The distribution, with respect of element size, of the intensity of temperature fluctuations impressed by external influences is modified by the effects of buoyancy and mixing, and relations are derived between the modified and unmodified distributions. *Subject Headings:* **1. Heat transfer 2. Heat conductivity.**—*Author's abstract.*

6.7–30 550.382/3 525.3

Elsasser, Walter M. and Tekeuchi, H., **Non-uniform rotation of the earth and geomagnetic drift.** Utah. Univ. Dept. of Physics, Contract Nonr 1288(00), Earth's Magnetism and Magnetohydrodynamics, Technical Report No. 11, Sept. 30, **1954.** 16 p. 2 figs., 10 refs. **DWB**—The transmission of mechanical forces of the magnetic field through the top layers of the core and into the mantle is analyzed. It is shown that moderate fluctuations of the toroidal field near the boundary of the core are adequate to produce the observed variations in the earth's rate of rotation. A simple model of the boundary layer of the core is worked out and it is shown that the angular velocity, on going down from the boundary of the core, must first decrease and then increase again, in agreement with the observations on the westerly drift and with the dynamo theory. *Subject Headings:* **1. Geomagnetic drift 2. Rotation of the earth.**—*Authors' abstract.*

6.7–31 550.383:551.1

Hospers, J., **Rock magnetism and polar wandering.** *Nature*, London, 173(4416):1183–1184, June 19, **1954.** 2 tables, 13 refs. **DWB**—Directions of permanent magnetism of recent rocks agree with present dipole field within 5% limits of error. This shows that over several thousand years magnetic poles have centered on geographic poles. Similar values for rocks

back to Eocene also mostly agree within 5% error, but Eocene lavas of N. Ireland differ significantly (angle with present field 11.5°). These data cannot be reconciled with theories of pole migration (KÖPPEN, etc.). *Subject Headings:* **1. Magnetization of rocks 2. Continental drift.**—*C.E.P.B.*

6.7–32 551.461.2:525.3

Munk, Walter and Revelle, Roger (*Scripps Inst. of Oceanography*), **Sea level and the rotation of the earth.** *American Journal of Science*, 250(11):829–833, Nov. **1952.** *California. University. Scripps Institution of Oceanography, Contributions, New Series*, No. 592. 13 refs. **DWB**—From ancient beach lines, DALY has proposed a eustatic lowering of sea level by about five meters during the last few thousand years. This would decrease the length of day by 30 milliseconds if the lowering is due to "rapid" growth of ice caps, and by 90 milliseconds if, as suggested by DALY, the lowering is due to isostatic afterflow in the earth's mantle following a rapid melting of ice caps. The corresponding value derived from ancient observations of eclipses, 27–18 milliseconds, indicates rapid growth of ice caps. For the last hundred years, tide gage records and the retreat of glaciers indicate a rise in sea level by 10 cm. This rise would displace the north pole of rotation by something like 10 feet towards the North Atlantic, the precise value and direction depending on the source of melted water. Such a displacement is not inconsistent with astronomic evidence. *Subject Headings:* **1. Rotation of the earth 2. Sea level variations 3. Polar displacement.**—*Authors' abstract.*

6.7–33 551.583.3:551.311.12

†Lawrence, Donald B. (*Dept. of Botany, Univ. of Minnesota*) and Elson, John A. (*Geological Survey of Canada, Ottawa*), **Periodicity of deglaciation in North America since the late Wisconsin maximum.** *Geografiska Annaler*, Stockholm, 35(2):83–104, **1953.** 6 figs., 66 refs. **DWB**—Glacier recessions in Europe and N. America are computed. The recessional history of the Herbert Glacier terminus is studied by means of an aerial photograph and moraine and forest surveys relating the successive deglaciation lines to solar activity, with a strong tendency for the formation of moraines during the sunspot minima. The glacier receded 2100 m from the beginning of the 18th century up to 1928 and another 1200 m in the following twenty years. The "Little ice age" which ended 150 years ago probably began early in the Christian Era. Reference is made to recent papers by Visher and Haurwitz on solar weather influences. The second part of the paper discusses the late Wisconsin recession on the basis of moraine observations in southern Manitoba. Recession moraines formed about 10,000 years ago suggest an annual but not an 11-year cycle. *Subject Headings:* **1. Glacier variations 2. Moraines 3. Sunspots 4. Herbert Glacier, Alaska 5. Manitoba, Canada.**—*A.A.*

EXPEDITIONS

See also: **International look at earth** (Ewing), 6.7–19; **Biography—Nordenskiöld** (Müller), 6.7–80.

6.7–34 551.311.184(99)

Debenham, Frank, **The ice islands of the Arctic: a hypothesis.** *Geographical Review*, New York, 44(4):495–507, Oct. **1954.** 6 figs., refs. **DWB**—Analogies to the Arctic ice islands were observed by the author in the Antarctic. Their size, durability, ribbed surfaces and the presence of rock and mud upon them form the basis of a theory of origin. In view of the small precipitation and the inconsiderable thaw along the Ellsmere coast it is concluded that the corrugated ice of the coastal fringe is not built up from above but rather from below. Hypothetical considerations and actual evidence are presented to show that the ice islands originate from fjord ice and are the result of growth from below. *Subject Headings:* **1. Arctic ice islands 2. Ice island sources 3. Antarctica.**—*I.L.D.*

6.7–35 551.311.184(268)

Tiedemann, Karl-Heinz, **Eisinseln in der Arktis.** [Ice islands in the Arctic.] **Polarforschung**, Kiel, [Ser.] 3, 23(1/2):215–218, **1953.** **DWB**—Describes the ice island "Target 1"

in the Arctic Ocean and its drift in 1946–49. Two others, T2 and T3, were found in July 1950. A meteorological station was set up on T3 in March 1952. Measurements of temperature of ice and sea are quoted. Other ice islands are described. Some remarks are made on Arctic drift circulation, shelf ice etc. *Subject Headings:* **1. Floating ice islands 2. Arctic sea ice.**—*C.E.P.B.*

6.7–36 551.506.4(987)

Orvig, S., **Meteorological work in Baffin Island.** *Weather*, 10(3):72–77, March **1955.** fig., 2 plates, table, 6 refs. **DWB**—Description of Arctic Institute of North America summer expeditions to Barnes ice cap in 1950 and Cumberland Peninsula with Penny ice cap in 1953. Glaciological work is described. A brief summary of meteorological observations is given. Albedo of snow surface 0.81. Heat for ablation was supplied mainly by radiation. *Subject Headings:* **1. Arctic expeditions 2. Baffin Island, Canadian Arctic.**—*C.E.P.B.*

6.7–37 91.04(988)

Hamilton, Richard, **Scientific work of the British North Greenland Expedition,** 1952–54. *Polar Record*, 7(48):177–180, July **1954. DLC**—This further description of work in Dronning Louises Land includes surveying, glaciology, micrometeorology, etc. and physiology. *Subject Headings:* **1. Arctic expeditions 2. British Greenland Expedition, 1952 3. Greenland.**—*C.E.P.B.*

6.7–38 551.506.5(988)

Mackersey, Ian, **Rescue below zero.** N. Y., W. W. Norton, **1954.** 214 p. photos. **DLC**—A popular account of the near disaster which befell an airplane crew which was dropping supplies to the base of the British Greenland Expedition in 1952, and their rescue by USAF planes. A map shows main ice-cap stations of expeditions since 1949, and the places and dates of rescue operations, as well as the main coastal stations. *Subject Headings:* **1. Arctic expeditions 2. British Greenland Expedition, 1952 3. Greenland.**—*M.R.*

6.7–39 551.311.18:621.396.826

The detection of ice by radar. *Marine Observer*, 24(165):150–162, July **1954.** 13 figs., 2 tables. **MH-BH**—Account of expedition by L. S. LePage and A. P. Milwright from Quebec to Hudson Bay, June–Aug. 1952 in the ice-breaker "N. B. McLean," using Type 268 radar, telephoto cine-camera and an electrical distant-reading psychrometer at a height of 50 ft with Assmann psychrometers at 30 and 6–10 ft to determine refractive index. A number of photos and P.P.I. pictures are reproduced. Records of detectability of ice are tabulated in terms of size and distance. *Subject Headings:* **1. Sea ice 2. Radar echoes 3. Canadian Arctic.**—*C.E.P.B.*

6.7–40 551.506.5(989)

Fristrup, Børge, **Peary Land. En foreløbig redegørelse for geografisk arbejde paa Dansk Peary Land Ekspedition.** [Peary Land. A preliminary account of the geographic work by the Danish Peary Land Expedition.] *Geografisk Tidsskrift*, Copenhagen, 49:41–66, **1948/1949.** fig., table, photos., fold map. **DWB**—In addition to an account of the various expeditions that have visited Peary Land, of the organization and activities of the present Danish expedition, and of the topography, the author discusses the meteorology and glaciology of the region. A table gives monthly mean temperature, monthly extremes, and monthly absolute temperatures for 1948–49. *Subject Headings:* **1. Arctic expeditions 2. Expeditionary climatic data 3. Danish Peary Land Expedition, 1947–1950 4. Peary Land, Greenland.**—*I.L.D.*

6.7–41 91.04(98/9)

Rapports scientifiques des expéditions polaires Françaises. [Scientific reports of the French Polar expeditions.] *Annales de Géophysique*, 9(1):33, Jan./March **1953. DWB**—Scientific results of recent French polar expeditions will be published in the journal. Four summer expeditions (1948–51) and two winterings (1949–50 and 1950–51) in Greenland, as well as two winterings on Adélie Land (1950–51 and 1951–52) were made. *Subject Head-*

ings: **1. Polar expeditions 2. Expéditions Polaires Françaises 3. Greenland 4. Adélie Land, Antarctica.**—*A.A.*

6.7–42 551.311.17

Holtzscherer, J. J. and Robin, G. de Q., **Depth of polar ice caps.** *Geographical Journal*, 120(2):193–202, June **1954.** 3 figs., fold. plate, 11 refs. **DWB**—Holtzscherer describes seismic soundings by Expéditions Polaires Françaises in Greenland and Adélie Land. Cross sections of inland ice are shown. The mean thickness of ice in Greenland is about 1600 m, volume 2.7×10^6 km^3. Robin describes similar work in Dronning Maud Land, Antarctica, including thickness of floating ice shelf. J. W. Glen discusses the bearing of the results on the theory of glacier flow; they support the theory of J. F. Nye. *Subject Headings:* **1. Ice caps 2. Expéditions Polaires Françaises 3. Greenland 4. Antarctica 5. Glen, J. W.**—*C.E.P.B.*

6.7–43 551.46:91.04

Diaz, Emilio, **La campaña Antartica 1951–1952.** [Antarctic expedition 1951–1952.] *Sociedad Científica Argentina, Anales*, 155(2):29–43, **1953.** 7 figs. **DLC**—Descriptive report on scientific work accomplished on Graham Land with photos of ice conditions, camps, etc. Some remarks on the convergence in the Antarctic Ocean between Graham Land and South America and a secondary convergence at the Weddell Sea. *Subject Headings:* **1. Antarctic expeditions 2. Oceanographic convergence 3. Argentine Antarctic Expedition, 1951–1952 4. Graham Land, Antarctica.**—*A.A.*

6.7–44 061.4:91.04(99)

W——, C. H., **A polar exhibition on board the "Discovery."** *Marine Observer*, 21(154): 230–232, Oct. 1951. 2 figs. **MH-BH**—An account of an exhibition in 1951 in the Thames to illustrate 50 years of British Antarctic exploration. Meteorology is briefly referred to. Photographs of "Terra Nova" and "Discovery" included. *Subject Headings:* **1. Antarctic expeditions 2. Exhibitions.**—*C.E.P.B.*

6.7–45 92

The Arctic Council of 1851. *Polar Record*, 6(43):385–389, Jan. **1952.** photo and key. **MH-BH**—Council to plan relief of Sir John Franklin's expedition of 1845. Includes brief biographies of Sir G. Back, Sir W. E. Parry, E. J. Bird, Sir J. C. Ross, Sir F. Beaufort, J. Barrow, Col. E. Sabine, W. A. B. Hamilton, Sir J. Richardson and F. W. Beechey. *Subject Headings:* **1. Biography 2. Arctic Council, 1851 3. Franklin Expedition, 1845–1847.** —*C.E.P.B.*

NETWORKS—OBSERVATORIES

See also: **Annual report** (Natl. Oceanogr. Council), 6.7–86; **Oceanographical lab.** (Deacon), 6.7–87.

6.7–46 551.501.9:551.43

Joint Commission on High Altitude Research Stations, **The world's high altitude research stations. A list of high altitude research facilities.** N. Y. Research Div., College of Engineering, N. Y. Univ., March 1, **1954.** 84 p. numerous photos, appendices. **DWB**—Fairly elaborate questionnaires filled out by about 40 high altitude observatories in various parts of the world are reproduced along with a number of full page photographs of observatories, and tabular data on these and on astronomical and on possible or once-occupied high altitude observatories. Among the data supplied are height and coordinates of stations (in meters or feet), high and low winter and summer temperatures, snow, location, facilities, description of buildings and access to observatory, type of work conducted (cosmic ray, magnetic, meteorological or astrophysical). The highest station is Chacaltaya near La Paz, Bolivia, at 5200 m (17,000 ft) with a Top House at 5490 m (18,000 ft). Proposed sites include Kilimanjaro at 19,565 ft. *Subject Headings:* **1. High altitude observatories 2. Cosmic ray research stations 3. Chacaltaya, Bolivia. I. International Council of Scientific Unions II. Korff, Serge A.** (*ed.*) **III. Neuburg, Hugo A. C.** (*ed.*).—*M.R.*

6.7–47 523.7

Gnevyshev, M. N., **Gornaia astronomicheskaia stantsiia.** [A mountain astronomical station.] *Priroda*, Moscow, No. 9:47–52, Sept. **1953.** 5 figs., 9 photos. **DLC**—A general description of physical properties of solar corona and brief outline of the progress in observation methods and results obtained. The author gives a rather detailed report on the installations and operation of the recently organized Mountain Astronomical Station near Kislovodsk (Caucasus 2130 m) attached to the Main Astronomical Observatory (Pulkov) of the Academy of Sciences. Figures show the instruments and some photographs of coronas and spectra registered. Points out that the combination of instruments used by this station permit simultaneous investigation of physical conditions in the disturbed places of the solar atmosphere and individual formations in connection with all the other phenomena. The importance of simultaneous and combined study is stressed and reference made to many instances of fruitless work when trying to investigate solar phenomena separately from other closely associated phenomena. Much attention is paid to the training of scientific personnel (students of graduate courses from Leningrad and Kiev universities). *Subject Headings:* **1. Astrophysics 2. Sun's corona 3. Astronomical observatories 4. Kislovodsk, U.S.S.R.**—*N.T.Z.*

6.7–48 551.5:06

[De Witt, J. Doyle], **The Travelers Weather Research Center.** *Weatherwise*, 7(6):159, Dec. **1954.** photo. **MH-BH**—The first privately owned weather forecast and research center "in the world" is being established at Hartford, Conn., by Travelers Insurance Co., of that city. It will be called Travelers Weather Research Center and will investigate weather in relation to accidents, property damage, and crop losses as well as highway conditions. The forecasts will supplement those of the U. S. W. B. which has moved to an airport 12 miles NW of Hartford. THOMAS F. MALONE of the MIT Dept. of Meteorology will head both the research and forecast aspects of the service. *Subject Headings:* **1. Private weather services 2. Insurance meteorology 3. Industrial meteorology 4. Travelers Weather Research Center 5. Hartford, Conn. I. Malone, Thomas F.**—*M.R.*

6.7–49 551.5:06

East African Meteorological Department new headquarters building. *World Meteorological Organization, WMO Bulletin*, 3(4):144–145, Oct. **1954.** photo. **MH-BH**—The meteorological service in E. Africa was first established in 1929 with main stress on agricultural meteorology and climatology. A. WALTER was Director until 1947. The new building and present activities of the service are described and illustrated. The building is on a 10 acre plot on the outskirts of Nairobi, which was especially chosen because of its favorable meteorological and radar exposure. Precipitation areas can be detected up to 200 miles by means of the new radar installation. D. A. DAVIES is now Director. The service now embraces all fields of human endeavor. *Subject Headings:* **1. Meteorological services 2. East African Meteorological Service 3. Meteorological observatories 4. Nairobi, East Africa.**—*M.R.*

6.7–50 551.501.9(98)

The Joint U. S.-Danish Weather Station at "Nord" in north-east Greenland. *Polar Record*, Cambridge, Eng., 7(48):206–207, July **1954.** **DLC**—This note, which is based on a report published in **Colliers** of June 14, 1952, contains a few details concerning "Operation Parkway" in which a site was occupied and material and labor provided for the construction of Weather Station "Nord" on Prinsesse Dagmars Halvø, N.E. Greenland. The operation took place in 1952. *Subject Headings:* **1. Arctic weather stations 2. Prinsesse Dagmars Halvø, Greenland.**—*G.T.*

6.7–51 551.501.9:551.586

S, —, **Die bioklimatische Turmstation am Hygiene Institut in Wien.** [Bioclimatic tower station at the Hygiene Institute in Vienna.] *Wetter und Leben*, 6(3/4):71, June **1954.** **DWB**—The bioclimatic station which is located upon the building of the University Institute of Hygiene finally went into full operation in 1953. The following elements are recorded: wind intensity, illumination intensity, global radiation and intensity of the atmospheric electric field. *Subject Headings:* **1. Bioclimatic stations 2. Vienna, Austria.**—*I.L.D.*

6.7–52 551.5:06(43)

Schmitt, W., **The German Federal Meteorological Service.** *South Africa. Weather Bureau, News Letter*, No. 67:6, Oct. 31, **1954. DWB**—Services in West Zone of Germany were merged on Nov. 11, 1952 and the Federal Meteorological Service established as a division of the Ministry of Transport under DR. BENCKENDORFF. Economic and service aspects of the various West German Centers (Bad Kissingen, Frankfurt, Hamburg, Quickborn telecommunication station, etc.) mentioned. *Subject Headings:* **1. German Federal Meteorological Service 2. Quickborn, Germany.**—*M.R.*

6.7–53 55(09)

Pícha, Jan, **Třicet let Státního Ústavu Geofysikálního.** [Thirty years of the State Geophysical Institute.] *Meteorologické Zprávy*, 4(3–4):69–70, **1950.** 4 photos. **DWB**—The Czechoslovakian State Geophysical Institute at Prague was established on Dec. 29, 1920 under the directorship of VÁCLAV LÁSKA (1862–1943). The work and instruments developed at the Institute, mostly in geomagnetism, seismology and geodesy are briefly described. *Subject Headings:* **1. Geophysical institutes 2. History of geophysics 3. Czechoslovakia.** —*M.R.*

CONGRESSES, CONVENTIONS, ETC.

See also: **Polar exhibition** (W—), 6.7–44.

6.7–54 550.3(05)

International Union of Geodesy and Geophysics. **Bulletin d'Information. I.U.G.G. News-Letter.** First issue received, 2, (1), Jan. 1953—Last issue recd., Vol. 3, No. 6, July **1954.** Quarterly beginning Jan. 1953. One number issued in 1952. Articles in French or English. Price: per number, 750 Fr. **DWB**—A series containing business of the I.U.G.G. and affiliated organizations. Reports of numerous associations of the I.U.G.G. during the past year are printed in detail in Vol. 2, No. 2. These include the reports of the International Symposium on Atmospheric Ozone at London, The Association of Scientific Hydrology, Arid Zone Research Committee, Joint Commission on Ionosphere, Oceanography, High Altitude Research status, announcements of meetings and program for the International Geophysical Year, 1957–58. These reports are abstracted separately. *Subject Headings:* **1. I.U.G.G. News-Letter 2. Serial publications.**—*M.R.*

6.7–55 550.3:06

Sans Huelin, Guillermo, **La IX Asamblea General de la Union Internacional de Geodesia y Geofísica.** [Ninth General Assembly of the International Union of Geodesy and Geophysics.] *Revista de Geofísica*, Madrid, 10(40):332–337, Oct./Dec. **1951. DWB**—Report on geophysical activities at I.U.G.G. meeting at Brussels in August 1951. The Spanish delegation is listed, works affecting Spain in particular cited, and general resolutions affecting European geodesy, oceanography, magnetism, Polar Year and Equatorial Year projects mentioned. *Subject Headings:* **1. International Union of Geodesy and Geophysics, meetings Brussels, 1951 2. Geophysical conferences.**—*M.R.*

6.7–56 550.3:061.3

Sawyer, J. S., **International Union of Geodesy and Geophysics. General Assembly Rome, 1954.** *Meteorological Magazine*, London, 83(990):371–372, Dec. **1954. DWB**—Summary of proceedings Sept. 14–25. Special interest attached to symposia on meridional large-scale phenomena, numerical methods in dynamic and synoptic meteorology, and storm surges. *Subject Headings:* **1. International Union of Geodesy and Geophysics, meeting, Rome 1954 2. Geophysical conferences.**—*C.E.P.B.*

6.7–57 551.5:06

World Meteorological Organization, **Annual Report, 1953.** Its *WMO Publication*, No. 29, RP. 14, **1954.** 83 p. tables (fold.). **DWB**—The 1953 annual report of the WMO combines the report of that body to the United Nations (or UNESCO) and that of the Secre-

tariat to the membership of the WMO. Among the features of the report are: 1) major developments, 2) participation in cooperative projects; 3) relations with UN and other agencies; 4) composition of WMO, new applications and action thereon, countries and dependent services which are members, executive committee, regional associations (6), technical commissions (8); 5) technical assistance programs for 1953, 1954 and 1955; 6) special projects; 7) commission meetings (7) during year; 8) staff and finances and 9) list of permanent members and their official representatives. *Subject Headings:* **1. World Meteorological Organization 2. Annual service reports. I. Swoboda, G.**—*M.R.*

6.7–58 551.5:06

Bodolai, István, **A Meteorológiai Világszervezetről.** [On the World Meteorological Organization.] *Időjárás*, Budapest, 58(4):224–227, July/Aug. **1954.** Russian and French summaries p. 224. **MH-BH**—History, organizational structure, conferences and other activities of the WMO and its commissions are briefly discussed. While acknowledging the importance and the many useful resolutions of the organization, the author criticizes certain WMO decisions motivated "by considerations foreign to meteorology," such as the exclusion of Communist China. *Subject Heading:* **1. World Meteorological Organization.**—*G.T.*

6.7–59 551.5:06(04)

Reichelderfer, Francis W., **The WMO in world meteorology. (Address?) AMS, Baltimore, April 29, 1954.** 3 p. charts. Mimeo. **DWB**—The major purposes of the WMO are outlined and the functioning of the organization is explained. The important decisions of the 1951 Congress and the task of the second Congress in 1955 are briefly mentioned. Proposals which might come up before the second Congress (8 in number) are mentioned, including expanded publication, an international research institute, assistance in the International Geophysical Year, technical assistance, collaboration with FHO, UNESCO, etc. and support of fellowships. A list of technical commissions and 35 working groups is presented in the form of an organization chart for the WMO. *Subject Headings:* **1. WMO commissions and committees 2. World Meteorological Organization.**—*M.R.*

6.7–60 551.508:06 551.501:06

Langlo, K., **First session of the Commission for Instruments and Methods of Observation.** *World Meteorological Organization, WMO Bulletin*, 3(1):19–22, Jan. **1954.** photo. **DWB**—The **"Guide to international meteorological instrument and observing practice"** was reviewed. 980.665 cu/sec² was adopted as the standard gravity for barometric measurements. No agreement could be reached on reduction of pressure to mean sea level. International comparison of radiosondes was recommended. Other topics discussed were radiation, hygrometry, visibility, rain gage errors, etc. *Subject Headings:* **1. Meteorological instruments 2. Observation techniques. I. WMO. Commission for Instruments and Methods of Observation.**—*A.A.*

6.7–61 551.585.7(234.3):06

Langlo, K., **Alpine meteorology.** *World Meteorological Organization, WMO Bulletin*, 3(3):108, July **1954. DWB**—A brief description of the international meeting on Alpine Meteorology held at Davos on April 12, 1954. *Subject Headings:* **1. Alpine Meteorology Conference, 1954 2. Davos, Switzerland.**—*I.L.D.*

6.7–62 551.585.53

Langlo, K., **Arid zone research.** *World Meteorological Organization, WMO Bulletin*, 3(3):107–108, July **1954. MH-BH**—The activities of UNESCO in developing arid zone research and the general program of symposiums to be in New Delhi, Oct. 1954 and the possible application of climatic data for arid zone research are considered. *Subject Headings:* **1. Arid zone research 2. UNESCO.**—*I.L.D.*

6.7–63 551.481:061.3(493)

Lenz, Fr., **Internationaler Limnologen- Kongress in Belgien.** [International Limnology Conference in Belgium.] *Naturwissenschaftliche Rundschau*, 4(1):33, Jan. **1951. DWB**—Brief note on conference at Ghent, Brussels, Lowen and Lüttich Aug. 16–26, 1950. There

were 90 delegates (6 from Germany) from 19 countries and 45 papers were read. The 12th conference will be held in England (1953) and the 13th in Finland (1956). The previous one was held at Zürich in 1948. *Subject Headings:* **1. Limnology conferences 2. Belgium.**—*M.R.*

6.7–64 5:06

Thompson, Dorothy Jean (*Sec'y Geophysical Inst., Alaska Univ.*), **Resume of Fourth Alaska Science Conference.** *Science*, 119(3084):176–177, Feb. 5, **1954. DWB**—Sponsored by Alaska Div., AAAS and held at Juneau, Alaska, Sept. 28–Oct. 3, 1953, with 159 scientists attending. C. T. Elvey, Dir. of Univ. of Alaska, Geophysical Institute, retiring president, spoke on Solar Energy and Sir Charles Normand of Oxford, England, spoke on Ozone and Upper Air Conditions. Symposia on biogeography, biology, agriculture, medicine and health, engineering and geology, and physical sciences were held. The auroral research in Alaska was discussed at the last named session. *Subject Headings:* **1. Alaskan Science Conference, 1953 2. Meteorological research 3. Alaska.**—*M.R.*

6.7–65 551.5:551.46:061.3

Commonwealth oceanographic conference. *Nature*, London, 174(4443):1175–1176, Dec. 25, **1954. DWB**—After a statement of the aims and difficulties of oceanography, a brief account is given of the Commonwealth Oceanographic Conference on Oct. 18–22, 1954, at the National Institute of Oceanography, Wormley, England. Subjects recommended for basic study were interchange of energy between atmosphere and oceans, response of sea surface to winds and pressure changes, circulation of the oceans and distribution of marine organisms and organic production. *Subject Headings:* **1. Oceanography 2. Oceanographic conferences 3. Wormley, Surrey, Eng.**—*C.E.P.B.*

6.7–66 5:06

Eggan, Fred (*Dept. of Anthropology, Chicago Univ.*), **Report on the Eighth Pacific Science Congress and Fourth Far-Eastern Prehistory Congress.** *Science*, 119(3083):145–148, Jan. 29, **1954. DWB**—Conference held in Manila Nov. 16–28, 1953 was attended by over 700 delegates from 30 countries and 20 fields of science. The sessions in meteorology consisted of 9 symposia with informal discussions of research projects in the Pacific area, forecasting, cloud physics, typhoons, easterly waves, microseisms and climatology, etc. The oceanography sessions consisted of 6 symposia with 85 papers. Joint meetings were also held. The next congress will meet in Bangkok, Thailand in Jan. 1958. *Subject Headings:* **1. Pacific Science Congress, 1953 2. Meteorological symposia 3. Manila, Philippine Islands.**—*M.R.*

BIBLIOGRAPHIES, INDEXES, GLOSSARIES

See also: **Geophysics** (Bartels), 6.7–26.

6.7–67 551.594.223:016

†Aniol, R., **Der Kugelblitz. Eine Bibliographie.** [Ball lightning. A bibliography.] *Meteorologische Rundschau*, 7(11–12):220–222, Nov.–Dec. **1954.** 45 refs. **MH-BH**—An account is given of *Der Kugelblitz* by W. Brand (1923). Theories of ball lightning published since 1923 are listed. The reality of published photos is discussed. *Subject Heading:* **1. Ball lightning bibliographies.**—*C.E.P.B.*

6.7–68 5(03)

London. Science Museum. Science Library, **Technical glossaries and dictionaries.** *London. Science Museum. Science Library, Bibliographical Series*, No. 707 (incorporating Science Library Bibliographical Series, No. 632 and supplements), [1952]. 82 p. **DWB**—Several hundred glossaries in all fields of science and technology are listed. The entries are arranged according to the U.D.C. system. On p. 14–15 under 551.5 (Meteorology) are listed 13 glossaries, including lists of terms in Japanese, Chinese, Catalan, Russian, Afrikaans-English, French-Dutch, and the 9 language English glossary of the Meteorological Office, London. Of course many glossaries in broader subjects are useful to meteorologists. Contains 13 page author index. *Subject Headings:* **1. Glossaries 2. Dictionaries.**—*M.R.*

6.7–69 551.5:016

†**Meteorology, Climatology, Hydrology, Oceanography in the Soviet Union.** No place, no publisher [1954]. 121 p. Mimeo. **DWB**—About 400 reference to Russian and Polish literature in the fields of: 1) meteorology, 2) agricultural meteorology, 3) climatology and microclimatology, 4) hydrology, 5) oceanography and 6) education, training, etc. are included. Most of the references are annotated; many refer to abstracts published in Meteorological Abstracts and Bibliography during the period 1950–1953 (vol. 1–4). The material on meteorology is subdivided according to 13 different categories (such as forecasting, visibility, radiation, temperature, textbooks, etc.). Library where work may be found and English translation, if available, are indicated. Original title is given in Library of Congress transliteration. No index. *Subject Headings:* **1. Abstracts of Slavic meteorological literature 2. Meteorology bibliographies.**—*M.R.*

EDUCATION AND HISTORY

EDUCATION

See also: **Geophysics** (Bartels), **6.7–26.**

6.7–70 550.3

Bronwell, G. L., **Physics in South America.** *Physics Today*, 5(7):5–12, July **1952.** 2 figs. **DWB**—Among the many research and teaching activities reported on after an extensive trip throughout the countries of South America, are the investigations of cosmic ray showers, mesons, etc. in the laboratory, in mines and at high latitudes. SERGE A. KORFF gave a series of lectures on cosmic rays in several countries during 1950. Huancayo (Peru) Geophysical Institute, Chacaltaya Observatory in Bolivia and Morococho Observatory in Peru carry on work of geophysical interest. Other similar work is being done in Brazil and Argentina. *Subject Headings:* **1. Geophysical observatories 2. Geophysical research 3. South America.** —*M.R.*

6.7–71 551.5:37

Gilchrist, Bruce (*Sci. Dept., Malden H. S.*), **A weather course in Malden High School.** *Weatherwise*, 7(5):114–115, Oct. **1954.** 4 photos. **MH-BH**—One of the few secondary schools to give a full year course in meteorology and aeronautics. A complete weather station and an experimental "Weather Bureau" is provided. The course is quite popular with boys because it gives advantages in their military service. *Subject Headings:* **1. Teaching of meteorology 2. Malden, Mass.**—*A.A.*

6.7–72 551.5:06

Merewether, Arthur F. (*President of Am. Met. Soc.*), **Meteorology in our secondary schools.** *Weatherwise*, 7(5):111, Oct. **1954.** port. **MH-BH**—Meteorology, as the basic science dealing with our environment, should be better understood by the general public. About 300 students, against 4,800,000 entering primary school each year, get degrees in meteorology. *Subject Headings:* **1. Careers in meteorology 2. United States.**—*A.A.*

6.7–73 551.5

Malone, Thomas (*M.I.T.*), **What is meteorology?** *Weatherwise*, 7(5):112–113, Oct. **1954.** fig., port. **MH-BH**—Brief characterization of the activities of physical, dynamic, synoptic, climatological, instrumental and engineering meteorologists, stressing their practical importance. *Subject Heading:* **1. Careers in meteorology.**—*A.A.*

6.7–74 551.481.1:37

Frey, David G., **The teaching of limnology in the United States.** *Scientific Monthly*, 76(5):290–296, May **1953.** illus., table, refs. **DLC**—The 66 colleges and universities in the U. S. giving courses in limnology, leading in over 20 of the institutions to a Doctor of Philosophy degree, are listed and problems, scope of instruction, field work etc., discussed. In

1930 only 16 schools in the U. S. and Canada gave such courses. Ten states do not now have any courses (mostly the Plains States). The range of science which touches on limnology is pointed out. Also the fact that limnology involves study of rivers and ponds and other inland waters as well as lakes. *Subject Headings:* **1. Teaching of limnology 2. United States.**—*M.R.*

HISTORY

See also: **Meteorology** (Schneider-Carius), 6.7–5; **Arctic Council**, 6.7–45.

6.7–75 551.594.223

Chirvinskiĭ, P. N., **Pervye nabliudateli sharovykh molniĭ.** [The first observers of ball lightning.] *Priroda*, Moscow, 43(8):116, Aug. **1954. DLC**—In connection with the 200th anniversary of the death of the academician G. V. Rikhman, the author describes the details of his death and points out the value of the testimony of engraver Sokolov who witnessed Lomonosov's experiment with the "thunder machine." Sokolov was the first man to observe the generation, by artificial means, of ball lightning (which killed Rikhman). *Subject Headings:* **1. Ball lightning 2. Lightning fatalities 3. Rikhman, G. V.**—*A.M.P.*

6.7–76 551.524.37:551.311.18

Ludlum, David M., **The famous Susquehanna Ice Bridge of 1852.** *Weatherwise*, 7(6): 156–158, Dec. **1954.** fig. **MH-BH**—A reproduction of an old lithograph shows the railroad line that was hastily constructed across the Susquehanna during a 2 months freeze up in Jan.–Feb. 1852 which prevented the car ferries from operating. Details of the event are given in the text. *Subject Headings:* **1. Cold winters 2. Ice bridges 3. Frozen rivers. 4. Susquehanna River, Pennsylvania.**—*M.R.*

6.7–77 522(09)

Barabashev, N. P., **Razvitie astronomii na Ukraine.** [Development of astronomy in the Ukraine.] *Priroda*, Moscow, 43(8):75–81, Aug. **1954.** illus. **DLC**—Presents a historical outline of the growth of the four oldest astronomical observatories (Kiev, Kharkov, Odessa and Nikolaev), organized at the beginning of the 19th century. *Subject Headings:* **1. Astronomical observatories 2. History of observatories 3. U.S.S.R.**—*A.M.P.*

6.7–78 551.509.312

Rossby, Carl-Gustav, **Stockholm Seminar Project.** Chicago. Univ. and Stockholm. University, Contract Nonr-613-(00), Subcontract No. 1, Final Report, Oct. 1, 1951–March 31, 1953, pub. March **1954.** 6 p. 10 refs. **DWB**—History of Stockholm Seminar Project which was transferred as a subcontract from the Univ. of Chicago during 1951 and completed in 1953 when the Subcontract was transferred to the Woods Hole Oceanographic Institution. Most of the scientific and developmental work done under this project, as is shown by the enumeration of accomplishments, had to do with the numerical prediction of isobaric or wind patterns. Lectures were attended by about 60 from U. S. and Europe. Lecture notes were made available. *Subject Headings:* **1. Stockholm Seminar Project 2. Numerical forecasting research.**—*M.R.*

BIOGRAPHY

6.7–79 551.46:92

Hansen, Walter, **In memoriam Vagn Walfrid Ekman.** *Deutsche Hydrographische Zeitschrift*, 7(1/2):65–66, **1954. DWB**—Dr. Ekman died March 9, 1954, shortly before his 80th birthday. He was well known for his work on oceanography, especially on the theory and computation of drift currents. *Subject Headings:* **1. Biography 2. Ekman, V. W.**—*C.E.P.B*

6.7–80 910.4:92

Müller, Martin, **Adolf Erik Nordenskiöld zum 50. Todestag am 12. August 1951.** [A. E. Nordenskiold, 50th anniversary of his death, Aug. 12, 1951.] *Polarforschung*, Kiel, [Ser.] 3, 23(1/2):244–246, **1953. DWB**—Born Nov. 18, 1832, at Helsingfors. As professor of geology

at Stockholm he made numerous Arctic expeditions between 1858 and 1883, including opening of sea route to Siberia. In 1878–79 in the "Vega" he sailed from Sweden to the Pacific. *Subject Headings:* **1. Biography 2. Nordenskiöld, Adolf Erik.**—*C.E.P.B.*

6.7–81 551.5:92 533.6:92

Relf, Ernest F., **Prof. L. Prandtl, For. Mem. R.S.,** *Nature*, London, 172(4384):836–837, Nov. 7, **1953. DWB**—Ludwig Prandtl, born 1875, died Aug. 15, 1953. Educated as an engineer, in 1907 he inaugurated a school of aerodynamics and hydrodynamics at Göttingen, in which he carried on a great deal of experimental and theoretical work on drag, flow of compressible fluids, boundary layer, etc. *Subject Headings:* **1. Biography 2. Prandtl, Ludwig.**—*C.E.P.B.*

APPLIED METEOROLOGY

MARINE METEOROLOGY AND OCEANOGRAPHY

See also: **Oceanography** (Snezhinskii), 6.7-11; **Biography—Ekman** (Hansen), 6.7–79; **Desert locusts swarms** (Rainey), 6.7–99; **Drift currents** (Hidaka), 6.7–236; **Storm floods** (Tomczak), 6.7–239.

6.7–82 551.46(05)

Deep-Sea Research, London, v. 1, no. 1, Oct. **1953**—Latest issue seen, 2(3), April 1955. Quarterly. Pub. by Lange, Maxwell and Springer, 242 Marylebone Road, London, N.W. 1. Price: $12.60 per vol. In English or French. Editors, L. Fage; Cameron D. Ovey and Mary Sears. **DN-HO.** Also reviewed in *I.U.G.G. Bulletin d'Information*, 3(5):57–59, April **1954. DWB**—A new journal established under the aegis of the Joint Commission on Oceanography of the International Council of Scientific Unions of UNESCO, as suggested at the first meeting of that commission in Monaco in 1952. The work published in this journal will be mainly confined to the geology, geography, physics and biology of the deep sea floor, layers or sediments, but articles on the geological and climatological history of the earth as deduced from studies of sediments will occasionally be presented. The editors are Prof. L. Fage (Paris), C. D. Ovey (Cambridge, England) and Mary Sears (Woods Hole, Mass.). The first issue gives evidence that the journal will be of the highest quality. *Subject Headings:* **1. Periodicals 2. Oceanographic periodicals 3. Deep sea research 4. Marine sediments.**—*M.R.*

6.7–83 551.582.3(26)

*Bullig, H. J., **Atlas der Monatswerte von Wassertemperatur, Wind und Bewölkung auf dem Seeweg Europa-Südamerika, auf Grund von Wetterbeobachtungen deutscher Handelsschiffe Bearbeitet in der Abteilung "Maritime Meteorologie."** [Atlas of monthly values of water temperature, wind and clouds on the Europe-South America sea route, on the basis of weather observations of German merchant ships, ed. by the Maritime Meteorology Division.] *Hamburg. Seewetteramt, Einzelveröffentlichungen*, No. 5, **1954.** 25 p. numerous tables and diagrs. (16 numbered tables), 18 refs. **MH-BH**—Observational material, statistical methods, and theoretical considerations are discussed in detail. The data on sea temperature, wind and cloudiness are presented in tables and diagrams. Charts are given for each month of each year for period 1906–1913 and 1922–1938 for anomalies of temperature, wind vectors and mean cloudiness. *Subject Headings:* **1. Marine atlases 2. Marine meteorological data 3. Water temperature data 4. Atlantic Ocean.**—*M.R.*

6.7–84 551.465(09)

Defant, Albert, **Turbulenz und Vermischung im Meer.** [Turbulence and mixing in the sea.] *Deutsche Hydrographische Zeitschrift*, 7(1/2):2–14, **1954.** 2 figs., table, 31 refs., 28 eqs. German, English and French summaries p. 2–3. **DWB**—Mixing of water masses was at first believed to occur only at boundaries of ocean currents but the importance of internal turbulence in the structure of currents was early recognized. Method of J. P. Jacobsen (1927) for determining diffusion coefficient by relations of salinity and temperature and development of theory of turbulent diffusion are described. L. F. Richardson's proof (1926)

that the coefficient of turbulence is proportional to the 4/3 power of the scale was later extended to ocean currents. The semipermanent wind systems (trades, westerlies) and extratropical disturbances provide energy for the large scale circulations which break down into ever finer whirls until they are small enough to pass into molecular friction and be dissipated as heat. The same result follows from the Weiszäcker-Heisenberg statistical theory of turbulence, which can be applied with modifications to ocean currents. *Subject Heading:* **1. Ocean currents.** —*C.E.P.B.*

6.7–85 551.501.1(26,02)

U. S. Weather Bureau, **Manual of marine meteorological observations.** 9th ed. *U. S. Weather Bureau, Circular M*, Jan. **1954.** 104 p. **DWB, DLC**—This 9th edition of the standard Weather Bureau instructions for merchant ships cooperating in the international marine weather reporting network conceived in 1853 at Brussels by M. F. MAURY, contains separate chapters, complete in themselves, dealing with all aspects of observing, recording, coding, transmitting, and summarizing the wind, visibility, weather, pressure, temperature, clouds, waves and ice conditions at sea, as well as code tables, and miscellaneous conversion or reduction tables, charts and illustrations of instruments. A good index is included (and a sample log is shown). First to 7th editions issued as **Instructions to marine meteorological observers.** *Subject Headings:* **1. Marine observers codes 2. Marine meteorological observations 3. Merchant ship observations 4. Observers manuals.**—*M.R.*

6.7–86 551.46:06

National Oceanographic Council (England), **Annual Report, 1950/1951**—Latest issue, 1952/1953, pub. **1954.** photos., refs. **DLC, DWB**—Report contains list of staff members, photo of Oceanographic Institute Building (library and laboratories) at Wormley, England, and a description of work of Institute which was formed early in 1953. Much of the material in the library and archives is transferred from the Oceanographic Branch of the Hydrographic Dept. of the Admiralty. J. N. CARRUTHERS of the above Branch has been made Asst. Director. Work in marine physics, biology and geology, and oceanographic expeditions during the year are summarized in detail. In marine physics much work has been done on wave and swell recording, analysis and forecasting; sea waves and microseisms; energy exchange between sea and atmosphere and in developing new instruments. Publications of staff members are listed. *Subject Headings:* **1. National Institute of Oceanography, Surrey, Eng. 2. Oceanographic research 3. Oceanographic institutes 4. Wormley, Surrey, Eng. I. Carruthers, J. N.** —*M.R.*

6.7–87 551.46:06

Deacon, G. E. R., **Dedication of the Laboratory of Oceanography, Woods Hole.** *Nature*, London, 174(4420):107–108, July 17, **1954.** ref. **DWB**—Summary of speeches at dedication ceremony. It was followed by a convocation on oceanography, including marine biology, circulation, submarine geology and relations between oceanography and meteorology. *Subject Headings:* **1. Oceanographic institutes 2. Woods Hole Oceanographic Institution 3. Woods Hole, Mass.**—*C.E.P.B.*

6.7–88 551.46.018

Carruthers, J. N. (*Natl. Inst. of Oceanog.*), **A new automatic current float.** *Water and Sanitary Engineer*, London, 5(1), May/June **1954.** [4 p.] 3 figs., 9 refs. **DN-HO**—The device described and illustrated in diagrams is an improved version of a "self-anchoring, self-signalling and self-timing drifting buoy." The buoy is suited for tracing surface as well as underwater movements; for the latter purpose underwater drogues are attached. *Subject Headings:* **1. Ocean current measurement 2. Underwater wave recorders.**—*G.T.*

6.7–89 551.46:639.2

†Carruthers, J. N., **Some inter-relationships of oceanography and fisheries.** *Archiv. für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, 6(1/2):167–189, **1954.** 4 figs., 22 refs. English, German and French summaries p. 167–168. **DWB**—An account is given of fisheries research organized by the International Council for Exploration of the Sea and other recent

research towards increasing products of fisheries. Author then discusses prediction of fishable populations, especially through study of wind-driven water movements. A survey is given of statistical possibilities and limitations. Finally, a "fisherman's submarine current indicator" is described and illustrated. *Subject Headings:* **1. Oceanographic research 2. Fisheries.**—*C.E.P.B.*

6.7–90 551.465

O'Hare, J. E.; Carlson, Q. H. and Tamblyn, W. E. (*Div. of Oceanog., U. S. Navy Hydrographic Off., Wash., D. C.*), **Some results of a tanker survey of the Gulf Stream.** *American Geophysical Union, Transactions,* 35(3):420–430, June **1954.** 15 figs., refs. **MH-BH**—An analysis is made of oceanographic observations taken aboard tankers over a period of one year between Key West and Cape Hatteras. The Gulf Stream is shown to have seasonal and tidal fluctuations in speed and position. Meanders, known to exist to the north, are shown to exist as far south as the Straits of Florida. *Subject Headings:* **1. Gulf Stream 2. Gulf stream drift 3. Gulf stream speed.**—*Authors' abstract.*

AVIATION METEOROLOGY

See also: **Airways forecasting,** 6.7–145; **Jet stream and airline operations** (Serebreny, Wiegman), 6.7–173; **Clear air turbulence,** 6.7–222; **Heavy turbulence,** 6.7–224.

6.7–91 551.5:629.13

Bellamy, John C. (*Cook Research Lab., Chicago, Ill.*), **Four dimensional flight planning.** *Navigation,* 4(3):105–113, Sept. **1954.** 4 figs. **DLC**—Prognostic contour charts (18,000 ft) combined with vertical pressure isogradients, can be conveniently utilized for the most economic planning of flights. A "pastagram" shows temperature, density and speed of sound on the charted surface and also relative changes of the topography up to 6000 ft from this surface. Basic hydrostatic and geostrophic relationships and their use in flight planning are explained. *Subject Headings:* **1. Flight planning 2. Prognostic charts.**—*A.A.*

6.7–92 551.5:629.13

Kelly, R. D. and Kaster, H. B. (*United Air Lines, Inc., South San Francisco*), **Simulated jet transport operation.** *Society of Automotive Engineers, N. Y., S.A.E. Preprint,* No. 298, **1954.** 8 p. tables, 5 figs. Photostat. "For presentation at the SAE National Aeronautic Meeting, New York, April 12–15, 1954." **DWB**—The effect of head or tail winds at 35–40 thousand ft and of temperature at points of take-off on fuel consumption or fuel load for flights with jet transports from San Francisco to Idlewild and return, with or without stop at Chicago, is shown in tables and discussed. It is concluded that the saving in time involved in varying flight level or flight path to take advantage of knowledge of winds at 35–40 thousand ft does not make up for loss due to fuel consumption when flying at other than the maximum cruising altitude or minimum flight path. *Subject Headings:* **1. Jet transport operation 2. Aeronautical meteorology 3. Temperature effects on jet aircraft 4. Wind effects on jet aircraft.**—*M.R.*

6.7–93 551.5:629.13

Perry, Ian, **Some aspects of comet flight of interest to the navigator.** *Navigation,* Los Angeles, Calif., 4(2):42–51, June **1954.** 3 figs. **DWB**—The meteorologist will be interested in the important effect of ambient temperature in the determination of the true airspeed of the "Comet" which has to be considered in the planning of the flight and the flight operation itself. A nomogram shows true airspeed versus Mach number and temperature. *Subject Headings:* **1. Jet flight planning 2. Aeronautical meteorology.**—*A.A.*

6.7–94 551.591:656.71

Tassëel, R., **Contribution a la définition et a la mésure des conditions d'atterrissage.** [Contribution to the definition and measurement of landing conditions.] *La Météorologie,* Paris, 4th Ser., No. 33:103,109, Jan./March, **1954.** 3 figs., eqs. French, English and Italian summaries p. 103. **MH-BH**—During landing the pilot needs to know the heights (H) at

which he begins to see the ground and the distance at each moment of the landing field beacons (V). The formulas for calculating H and V are presented. The determination of ceiling height of the pilot and of the pilot visibility depends upon a knowledge of N—threshold of illumination of the eye of the observer and S the surface. The determination of these parameters and the application of the proposed methods is illustrated. *Subject Headings:* **1. Airport landing conditions 2. Visibility from airplanes 3. Ceiling heights 4. Aeronautical meteorology.**—*I.L.D.*

INDUSTRIAL AND ENGINEERING METEOROLOGY

See also: **Temp. measurm. in industry** (Gordov, others), 6.7–8; **Radar echoes from ice, 6.7–39.**

6.7–95 551.5:621.311

Dilloway, A. J. (*UN Econ. Commission for Europe*), **Applied meteorology and electric power supply.** *World Meteorological Organization, WMO Bulletin*, 3(4):136–141, Oct. **1954.** 2 figs. **MH-BH**—How weather affects the power supply, the equipment and the rate of consumption of power, and the way in which meteorologists can help eliminate the weather effects, or make a contribution by forecasting stream flow or by research in hydrometeorology are considered in this informative article. Meteorologists are also needed in design of equipment to minimize climatic effects, or in planning construction projects. *Subject Headings:* **1. Industrial meteorology 2. Electrical engineering 3. Hydrologic forecasting.**—*M.R.*

6.7–96 551.524:621.311

Fleischmann, Edwin (*Consulting Engr., S. Francisco*), **How outdoor temperature affects electric system loads.** *Electrical West*, San Francisco, 112(6):92–96, June **1954.** port., 8 figs., 2 tables. **DLC**—This study of the over-all effect of outdoor temperature upon system load or upon the demand created by large segments of industrial and commercial load considers the problem from the aspects of (1) establishing a technique for measuring temperature affected load, (2) using degree-hour, (3) the varying impact of hourly temperatures upon hourly load and (4) differences in impact of temperature-affected load on weekend and weekdays. *Subject Headings:* **1. Temperature effects on power consumption 2. Power consumption 3. Degree days.**—*I.L.D.*

6.7–97 551.594.22:6:621.311.2

Leyburn, H., **Continuity of electricity supply. The Parsons Memorial Lecture.** *Institution of Electrical Engineers, Proceedings*, Pt. 1, 101(131):275 283, Sept. **1954.** 14 figs. **DLC**—Lightning is the biggest single cause of faults on power lines in most countries. Even in Great Britain 40% of faults on overhead lines and 20% on the power system are due to lightning. Much research is being done to determine nature of cloud-ground lightning strokes, 90% of which are found to have negative polarity. *Subject Headings:* **1. Electric power lines 2. Lightning damage 3. Lightning research.**—*M.R.*

6.7–98 628.54:551.482

Davis, Charles C. and Roney, Harland B., **A preliminary study of industrial pollution in the Cleveland Harbor area, Ohio. Pt. 1, Physical and chemical results.** *Ohio Journal of Science*, 53(1):14–30, Jan. **1953.** 15 figs., table, refs. **DLC**—Data obtained during 23 measuring and sampling trips to 9 established stations in the Cleveland Harbor area are presented (Sept. 1950–Sept. 1951). The purpose of the project was to investigate the extent of water pollution in the harbor contributed by the Cuyahoga River. The elements measured are: water temperature, hydrogen ion, ferrous ion, sulfate ion, turbidity and plankton content of water. The measurements were completed by visual observations of water discoloration from an elevated point, these latter being correlated with wind direction. The conclusion is that industrial pollutants have a harmful effect on aquatic life in the river and harbor. *Subject Headings:* **1. Water pollution 2. Cuyahoga River.**—*G.T.*

6.7–99 551.58:628.53

*Humphrey, P. A. and Wilkins, E. M., **Diffusion and engineering climatology for the Berkeley Radiation Laboratory. A preliminary report.** U. S. Weather Bureau. Scientific Service Div., Dec. **1953.** 53 p. 15 figs., numerous tables. **DWB**—Since micrometeorological data are not available for the immediate vicinity of the California Univ., Radiation Laboratory, the conditions which would govern diffusion of stack gases must be inferred from general knowledge of lapse rates, flow patterns, local winds and topography plus temperature, cloud, precipitation and fog in the area. This report shows location of laboratory in relation to San Francisco Bay area and local topography, and analyzes the above factors together with selected data which are presented in tabular and graphic forms. Berkeley records for 35 yrs (wind) to 64 yrs (temperature and precipitation) are used. Brief record of upper air winds and temperatures are analyzed in much greater detail in connection with stability conditions. *Subject Headings:* **1. Climate of Berkeley, Calif. 2. Stack meteorology 3. Engineering 4. Berkeley, Calif.**—*M.R.*

6.7–100 551.521.1:621.47

Ghai, M. L.; Pandher, B. S. and Harikishandass, -- (*Natl. Physical Lab. of India, New Delhi & Messrs Devidayal Metal Industries Ltd., Bombay*), **Manufacture of reflector-type direct solar cooker.** *Journal of Scientific and Industrial Research*, New Delhi, 13(5):212–216, May **1954.** 5 figs., 4 refs. **DWB**—Manufacturing difficulties encountered by the National Physical Laboratory of India in developing a solar cooker of the reflector type. This is the first factory to be set up for production of a solar cooker on an industrial scale. Details of solution of problems, such as manufacture of parts using local technicians and materials are outlined and the cooker described and illustrated. *Subject Headings:* **1. Solar cookers 2. Solar energy utilization.**—*M.R.*

6.7–101 551.5:659.25

Smith, Charles Pennypacker (*Pacific Gas & Elec. Co., S. Francisco*), **Weather is our business.** *Electrical West*, San Francisco, 112(3):63–65, March **1954.** illus. **DLC**—The role of private meteorologists in supplying weather information to private business, in particular to public utilities is stressed. Some of the areas of the utility business in which meteorologists' skills can be used are (1) short range operational weather forecasts, (2) long range planning forecasts, (3) weather modifications, (4) snow surveys and runoff forecasts, (5) atmospheric pollution and (6) line loading design. *Subject Headings:* **1. Industrial meteorology 2. Public utilities forecasting.**—*I.L.D.*

AGRICULTURAL METEOROLOGY

See also: **Created microclimate** (Bensin), 6.7–317.

6.7–102 551.5:63

Burgos, Juan J., **Evolución de la meteorología agrícola.** [Evolution of agricultural meteorology.] *Meteoros*, Buenos Aires, 4(1/2):108–111, Jan./June **1954. DWB**—In this speech delivered before the Technical Commission of Agricultural Meteorology of the WMO, the author sketches briefly the development of agricultural meteorology since REAUMUR and then discusses in a general way the action of atmospheric processes upon the lithosphere, the development of scientific meteorology and the scope and tasks of agricultural meteorology. *Subject Headings:* **1. Progress in agricultural meteorology 2. Agricultural meteorology.**—*I.L.D.*

6.7–103 551.58:63

Ioffe, A. F., **Fizika i sel'skoe khoziaĭstvo.** [Physics and agriculture.] *Priroda*, Moscow, 43(7):3–9, July **1954. DLC**—The term physics is used in the very wide sense of physical principles. Therefore this article includes general discussions of various aspects of agricultural climatology such as the effect of radiation upon plant growth, soil temperature forecasting, soil moisture and soil temperature determination, etc. *Subject Heading:* **1. Agricultural climatology.**—*I.L.D.*

METHODS OF OBSERVATION

See also: **High altitude observatories,** 6.7–46; **U. S.-Danish weather station,** 6.7–50; **Bioclimatic tower station** (S—), 6.7–51; **Commission for Instruments . . .** (Langlo), 6.7–60; **Marine met. observ.,** 6.7–85; **Radiosonde corrections** (Scrase), 6.7–135; **Bouët's similarity index** (Sneyers), 6.7–273; **Snow surveying** (Beaumont), 6.7–280; **Hydrologic stations** (Kallós), 6.7–288; *see also* special bibliography on **Radar Cloud Physics Studies,** p. 997.

6.7–104 551.501:551.577.37

Frith, R., **Record of an unusually high rate of rainfall.** *Meteorological Magazine,* London, 84(994):124, April **1955.** fig. **DWB**—By fitting a strip chart mechanism in place of usual clock and drum to a tilting bucket raingage, a much more open time scale can be obtained. An example is illustrated. *Subject Heading:* **1. Excessive rainfall measurement.**—*C.E.P.B.*

6.7–105 551.501.42:551.508.41

British Standards Institution, London, **Barometer conventions and tables.** Its **B.S. 2520, 1954.** 49 p. 22 tables, 8 eqs. **DLC**—The development of barometer scales is described. The new standard refers to the whole barometer at 0°C and $g = 980.665$ cm/s²; 1 mb = 0.750062 mm Hg = 0.0295300 in Hg. Correction of readings to this standard and reduction of pressure from one level to another are explained. Useful tables give corrections of Fortin and various Kew barometers to 0°C and to standard gravity. *Subject Headings:* **1. Barometer corrections 2. Barometer standards.**—*C.E.P.B.*

6.7–106 551.501.1:551.524

Portman, Donald J., **Measurement of air temperature profiles.** *Johns Hopkins Univ. Laboratory of Climatology, Publications in Climatology,* 7(2):251–260, **1954.** 5 figs., 6 refs. **MH-BH**—Manually read thermocouples were chosen as the most suitable instruments for the measurement of temperature profiles. Aluminum shields reduce the radiation errors. The rotary selector switch is located in a thermos flask, the common reference junction is placed in a water-ice bath. An amplification system is provided. The thermocouple wire has to be calibrated. Instrumental, radiation and sampling errors are discussed, indicating that the normal accuracy of the whole system is within 0.05°C for temperature and 0.02°C for temperature differences. The errors are large under strong radiation conditions. *Subject Headings:* **1. Temperature measurements 2. Temperature profiles 3. Thermocouples.**—*A.A.*

6.7–107 551.501.45:519.272

Dedebant, G. and Machado, E. A. M., **Las funciones aleatorias. (Breve tratamiento teorico.)** [Random variables. (Brief theoretical treatise.)] *Meteoros,* Buenos Aires, 4(1/2):69–98, Jan./June **1954.** Spanish and French summaries p. 69. 13 refs., numerous eqs. **DWB**—A most rigorous exposition of the mathematical foundations of the theory of stochastic functions with special reference to its physical applications. The paper includes a definition of stochastic functions, a mathematical demonstration of the existence of stochastic functions and of their physical reality, the nomenclature of stochastic functions and their properties, stochastic integrations, the processes of homogeneous orthogonals, the null stochastic function, the theory of stochastic functions and Hilbertain space, stochastic functions considered as operators in Hilbertain space, the degree of casualty in Hilbertain space, orthogonal and spectral developments of stochastic functions, Fourier analysis and stochastic functions, application of stochastic functions to Brownian movement and the statistical theory of turbulence. An appendix presents the axiomatic definition of Hilbertain space. (For further development of the subject *see* 6.1–27, Jan. 1955 and 5.8–16, Aug. 1954, *MAB.*) *Subject Headings:* **1. Random variables 2. Statistics in meteorology.**—*I.L.D.*

6.7–108 551.501.45:681.14

Jaeger, J. C.; Clarke, J. D. and Oliver, A. R., **A mechanical differential analyser in the University of Tasmania.** *Australian Journal of Science,* 16(5):185–188, April **1954.** 3 figs., 3 refs. **DWB**—The first mechanical differential analyzer was built by HARTREE in Manchester, Eng. in 1935 (using Meccano parts). The first one in Australia was built at Sydney Univ.

about 3 years ago. The present machine of the Univ. of Tasmania is very inexpensive but can solve many non-linear problems involving differential equations, such as problems in electric circuits, hydraulics, or heat conduction where thermal properties vary with the temperature, without much waste of time, and with 99% accuracy. The principles and construction of the device are described and illustrated. *Subject Headings:* **1. Computing machines 2. Differential analyzers.**—*M.R.*

6.7–109 551.501.45:517.5

Mittmann, O. M. J., **Zur praktischen Analyse von Beobachtungsfolgen oder empirischen Funktionen.** [On the practical analysis of series of observations or empirical functions.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 8(1/2):113–120, **1955.** 5 tables, 3 eqs. German, English and French summaries p. 113. **DWB**—Owing to persistence or periodicity completely random series do not occur in nature. Author starts with the less rigorous principle that the standard error of the mean of a series of observations approaches zero as the length of the series increases to infinity. He deduces expressions and tables for the law of error of such series. An example is given from daily geomagnetic disturbance figures. *Subject Heading:* **1. Series analysis.**—*C.E.P.B.*

6.7–110 551.501.45:519.241.1

Schumann, T. E. W., **Concerning certain characteristic properties of meteorological time series.** *South Africa. Weather Bureau, Notos*, 2(4):254–262, **1953.** 2 figs., 4 refs. **DWB**—Studying the autocorrelation of molecular velocities in a gas and the conduction of heat along a uniform rod as model cases, the author arrived at the expression

$$R(t) = e^{-\alpha t}\left(\cos \beta t + \frac{\alpha}{\beta} \sin \beta t\right)$$

for the autocorrelation of meteorological time series (α, β constants). A reasonable agreement with the autocorrelation of pressure deviations was found. *Subject Headings:* **1. Autocorrelations 2. Persistence 3. Autocorrelation of pressure.**—*A.A.*

6.7–111 551.501.45:681.14

Schurz, Josef, **Elektrische Gehirne. Eine Einführung in das Arbeitsgebiet der IBM** (*International Business Machines Corporation*). [Electrical brains. An introduction to the province of the IBM.] *Naturwissenschaftliche Rundschau*, 8(2):54–61, Feb. **1955.** 8 figs. **DWB**—A simplified account is given of the principles and operation of tabulating and calculating machines. The capabilities of various types of machine and their fields of application are described. *Subject Heading:* **1. Computing machines.**—*C.E.P.B.*

6.7–112 551.501.6:551.521.3

Drimmel, Julius (*Vienna*), **Ein Nomogramm zur Bestimmung der nächtlichen Abkühlung.** [A nomogram for determining night cooling.] *Wetter und Leben*, Vienna, 5(7/9):171–175, **1954.** 3 figs., 7 refs., eqs. **MH-BH**—The nomogram developed by the author is based upon a relationship (established by H. Reuter) between cooling at 2 m above the ground and horizontal wind velocity at 35 m above the ground. The nomogram is reproduced and its application is illustrated. *Subject Headings:* **1. Nomograms 2. Nocturnal radiation.**—*I.L.D.*

6.7–113 551.501.7

Clem, LeRoy H.; Colson, DeVer and Harrison, Louis P. (*U. S. W. B., Wash., D. C.*), **Corrections of the upper-level wind computations for effect of earth's curvature.** *American Meteorological Society, Bulletin*, 35(8):357–362, Oct. **1954.** 8 figs., table, ref., 14 eqs. **MH-BH**—Two methods are developed for taking into account the effect of the earth's curvature on the computation of the upper-level winds for use in routine evaluation of rawin ascents. The first method involves the use of a correction (DE) to the observed elevation (E) angle; the mathematical formula for determining E and charts for evaluating this correction to observed elevation angle are presented. The second method yields the correct arc distances without additional computations. Examples of the corrections of wind speeds for the earth's curvature are presented. *Subject Heading:* **1. Upper air wind computation.**—*I.L.D.*

6.7–114 551.501.7:51

Henry, T. J. G.; Nurklik, A. and Thorn, W. A., **Vector mean winds and standard vecto deviations for selected rawin stations in Canada.** *Canada. Meteorological Div., Cir-25(* Tec-190, June 28, **1954.** 26 p. 2 tables, 2 refs. **DWB**—Vector mean (resultant) wind standard vector deviations and standard deviations of westerly and southerly components rawin stations in Canada having sufficiently long records are presented for the levels 1.5, 3 an 5 km. 7 km data are given for stations at which the percentage of terminations below 7 k is not too high. Vector mean winds and standard vector deviations interpolated or extra polated to 850, 700, 500 and, where possible, 400 mb are also given. Values of wind spee parameters for the higher levels are probably somewhat too low, because of the selective loss the higher wind speeds through low-angle terminations; the probable magnitude of this effe is discussed. Observations were summarized by overlapping two-month periods centere on the calendar months, in order to diminish sampling effects. Results are discussed briefl in relation to the general circulation over Canada. Standard vector deviations at 700 an 500 mb for the winter months agree fairly well with values shown on maps in **Upper Wind over the World,** but values for the other seasons tend to be higher than map values in mo areas. *Subject Headings:* **1. Upper air winds 2. Wind vector computations 3. Canad** —*Authors' abstract.*

OBSERVATIONAL DATA

See also: **Met. work in Baffin Is.** (Orvig), 6.7–36; **Rescue below zero** (Mackersey), 6.7–38; **Peary Land** (Fristrup), 6.7–40; **Report on met. data** (6.7–298).

6.7–115 551.506:551.521.1(43

*Liana, Franciszek, **Insolacja Warszawy w r. 1936.** [Insolation in Warsaw in 1936 *Acta Geophysica Polonica*, Warsaw, 2(4):183–187, **1954.** 2 tables, 4 refs., 2 eqs. In Polis French summary p. 187. **DWB**—Daily and monthly total global radiation on a horizont surface obtained at Warsaw during the year 1936 are tabulated in extenso. Results for oth years of the 1935–39 period, when records were obtained at Warsaw, were lost during the wa A second table gives the monthly total global radiation on cloudy days (total per year 45 cal/cm² or 6% of the total radiation on all days). Observations were made with a Gorczyńs solarimeter which was calibrated against an Ångström pyrheliometer. *Subject Heading* **1. Global radiation data 2. Warsaw, Poland.**—*M.R.*

6.7–116 551.5

Summer of 1954. Colloquium at the Meteorological Office, Harrow. *Meteorologic Magazine*, London, 84(994):97–105, April **1955.** 5 refs. **DWB**—J. Glasspoole compare the dull, wet, cool summer with previous summers. J. Pepper discussed summer of 195 in other parts of the world and the general pressure distribution preceding and accompanyi it which might be the cause. A. Gilchrist spoke on the upper air pressure and D. Dewa on upper air temperatures, R. F. M. Hay described conditions in the North Atlantic. number of speakers took part in the general discussion, emphasizing that the problem was n local. *Subject Headings:* **1. Cool summer, 1954 2. England.**—*C.E.P.B.*

6.7–117 551.506.1(71) 551.582(7

*Canada. Meteorological Division, **Average values of temperature and precipitatio Addendum to Volume I of Climatic summaries for selected meteorological stations in Canad** Toronto, Canada, **1954.** 29 p. almost entirely tables. **MH-BH**—The monthly and annu averages of air temperature and precipitation for stations in the Yukon Territory, the Nort west Territories and the Province of Newfoundland (including Labrador) and previous unpublished average values for first-order stations in other provinces are given. The tabl included are: an index giving the latitude, longitude and height above sea level of each statio for which data are given; average daily maximum temperature, average daily minimum ten perature, average daily temperature, average rainfall, average snowfall and average tot precipitation. Temperature is °F and precipitation is in inches. *Subject Headings:* **1. O servational data 2. Climatic data 3. Climatic summaries 4. Canada.**—*I.L.D.*

6.7–118 551.506.5(85)

*Dávila Cuevas, Rafael (*Inst. of Geog., Lima Univ.*), **Sobre observaciones meteorológicas de ruta y su importancia en el Perú.** [Meteorological observations en route and their importance in Peru.] *Lima, Peru. Universidad de San Marcos. Instituto de Geografía, Revista*, No. 1:65–73, **1954.** 3 photos., 3 charts (fold.), table. **DWB** A meteorological observation trip made in a truck carrying basic instruments is described. The trip took place on Feb. 13, 1954 along the Lima-Anticona route, covering the altitude range from 140 to 4570 m. Pressure, temperature, humidity, partial oxygen pressure and vapor pressure values are tabulated for the ten points of measurement; they are also graphically presented as functions of altitude (irrespective of the lapse of time between measurements). *Subject Headings:* **1. Mobile weather station data 2. Altitude effects 3. Lima, Peru.** *G.T.*

6.7–119 551.506.1(058)(914)

*Philippines. Weather Bureau, **Annual climatological review, 1952.** Pub. Jan. **1954.** 151 p. almost entirely tables. **DWB** This is the first annual climatological summary since the Philippine Weather Bureau was reestablished in 1945. It contains data from 43 synoptic stations, 34 climatological stations, 82 rainfall stations and 3 seismological stations. A summary of weather conditions (typhoons, temperature and rainfall distribution and effects on crops) is given for each month. Frequencies of rainfall of various intensities are given for each station for each month. In addition, standard temperature, relative humidity, cloudiness and pressure data tables are included for stations of a higher order, wherever such data are available. *Subject Headings:* **1. Annual climatic summaries 2. Climatic data 3. Philippine Islands.** *M.R.*

6.7–120 551.506.1:629.13(485)

*Sweden. Meteorologiska och Hydrologiska Institut. **Contributions to aeronautical climatology of Sweden, Pt. 3. 1953.** 58 p. almost entirely tables. **DWB** Aeronautical climatology of 7 Swedish Airport Stations, compiled in accordance with ICAO recommendations, and presenting tables (*in extenso*) of (1) cases of visibility (4 times daily) by selected wind direction and speed, (2) of height of cloud base (4 times daily) for selected wind speeds, and (3) cases of wind speeds for selected wind directions (using 14h data) for each month and for the year. (For Pt. I *see* 3.7–178, July 1952, *MAB.*) Pt. II not published yet. *Subject Headings:* **1. Aeronautical climatology 2. Ceiling and visibility data 3. Sweden.** *M.R.*

6.7–121 551.506.1(410)

Veryard, R. G., **Looking back at 1954.** *Weather*, 10(3):67–71, March **1955. DWB** Summary of the weather in Britain month by month. It was a poor summer but no records were broken. Anomalies in other parts of the world are briefly mentioned. *Subject Headings:* **1. Weather reports 2. British Isles.**—*C.E.P.B.*

6.7–122 551.506.8(493)

*Lardinois, Emile, **Observations phénologiques à Uccle au cours de l'année 1953.** [Phenological observations at Uccle during 1953.] *Ciel et Terre*, Uccle, 70(5/6):187–190, May/June **1954.** 4 tables. **MH-BH** The climatology of 1953 is described and a table giving the date of flowering for various phenologic indicators included. Tables giving the monthly deviations of temperature, precipitation, relative humidity and variation from the normal and the monthly normals (1901–1930) and means (1952–53) of the variables at Uccle are given. *Subject Headings:* **1. Phenological observations 2. Normal period (1901–1930) 3. Uccle, Belgium.**—*I.L.D.*

INSTRUMENT CARRIERS

See also: **Portable anemometer** (Hartley), 6.7–129; **Operation meteor XIOO** (Wastrom), 6.7–162.

6.7–123 551.507

Corwin, Elbert F. and van Straten, F. W. (*Naval Aerol. Service, U. S. Navy*), **The Navy's automatic weather stations.** *Weatherwise*, 7(4):89–91, Aug. **1954.** 1 fig., 3 photos. **MH-**

BH —Describes the automatic boat type, free floating and parachute weather stations developed by the U. S. Navy to supplement types developed during World War II for land stations (shore-based type). The boat type can be anchored in water up to 600 fathoms depth and sends coded radio signals for as long as 3 months with range up to 700 or 1000 miles. It measures air and water temperature, air pressure, speed and wind direction. Free floating buoy type sends signal for establishing location as well. Life and range are shorter than boat type—30 days and 400 miles, respectively. Parachute type will send every 6 hours for 3 weeks. *Subject Headings:* **1. Automatic weather stations 2. Parachute weather stations 3. Buoy weather stations.**—*M.R.*

6.7–124 551.507.3

Mastenbrook, H. J. and Anderson, A. D., **The transosonde.** *Weatherwise*, 7(4):79–81, Aug. **1954.** 4 figs. (incl. photos.). **MH-BH**—The prototype of the transosonde was the Japanese constant-level incendiary balloon used during World War II to deliver incendiary bombs to the United States. The ONR sponsored the "Skyhook" balloon development and project, and more recently the NRL (Navy Research Lab.) has developed the transocean sonde or transosonde for the Bureau of Aeronautics of the U. S. Navy. Essentials of the system, experimental work done at Tillamook, Ore., and Minneapolis, details of equipment and of one of the longest flights are described and illustrated. *Subject Headings:* **1. Constant level balloons 2. Transosondes.**—*M.R.*

6.7–125 551.507.321

Haig, T. O. (*Inst. of Tech., Illinois U.*), **Plastic balloons for high altitude research.** *Journal of Aviation Medicine*, St. Paul, Minn., 25(4):351–353, Aug. **1954. DLC**—The construction of polyethylene balloons, their operation including load capacity, launching and cost are discussed. Also the U. S. Air Force balloon program is described briefly. *Subject Headings:* **1. Polyethylene balloons 2. High altitude balloons.**—*I.L.D.*

INSTRUMENTS

See also: **Plant climate** (Searle), 6.7–4; **Commission for Instruments** (Langlo), 6.7–60; **Barometer conventions,** 6.7-105; **Soil temp. measurm.** (Chudnovskii), 6.7–214; *see also* special bibliography on **Radar Cloud Physics Studies,** p. 997.

6.7–126 551.508

Gautier, William K. (*Technical Reports Section, NBS*), **Meteorological instrumentation at the National Bureau of Standards.** *Weatherwise*, 7(4):86–88, Aug. **1954.** 2 photos. **MH-BH**—The first U. S. Weather Bureau radiosonde was developed by the U. S. National Bureau of Standards in 1936. Since that time improvements and evaluation of radiosondes have been carried on by the Bureau of Standards. Equipment was developed for the evaluation of hygrometer elements. Rapid response electric hygrometer elements have been developed for use in rapid rising radiosondes. A 63% change in indication is possible within $<\frac{1}{2}$ second at normal temperature and in 10 sec. at $-20°C$, or a 13–25 fold increase in speed of response, with use of the potassium dihydrogen phosphate (KH_2PO_4) as compared to the current lithium chloride (LiCl) humidity elements. Work has also been done on balloon testing; ceilometers and transmissometers for remote recording of ceiling and visibilities, automatic weather stations for the U. S. Navy and wiresondes. *Subject Headings:* **1. Radiosondes 2. Meteorological instrument development 3. Electric hygrometers.**—*M.R.*

6.7–127 551.508.25:535.6

Middleton, W. E. Knowles (*Natl. Res. Council, Canada, Div. of Phys.*), **Note on the computation of the alteration of color temperature by blue filters.** *Optical Society of America, Journal*, 44(6):499, June **1954.** 2 tables, 2 refs. **DLC**—Precise data are given on results of 6 observers' estimates of slope of plots of log T vs $.1/\lambda$, where T is spectral transmittance and λ is wave length [in using the H. P. GAGE (1933) method for determining the color temperature of the light from a tungsten lamp after passing through a blue filter from the spectrophotometric

ata obtained thereby]. The observers were all professional physicists (including the writer) nd the range of resulting color temperature for 5 filters, using 3000°K light, were 3297–3385, 520–5860, 7480–7790, 8700–8980 and 13,960–15,460°K, respectively. *Subject Headings:* **. Spectral transmittance of filters 2. Color temperature measurement.**—*M.R.*

6.7–128 551.508.26

McLean, J. A., **A method for constructing direct reading thermistor thermometers.** *ournal of Scientific Instruments*, 31(12):455–457, Dec. **1954.** 2 figs., 2 refs., 12 eqs. **DLC**— robust and easily operated direct-reading thermometer (0–50°C) was constructed by connecting a thermistor in series with a fixed e.m.f. The curve relating current to temperature as a point of inflexion near which it is linear to approximation ±0.1°C. Wiring diagrams re given. *Subject Heading:* **1. Thermistors.**—*C.E.P.B.*

6.7–129 551.508.53/4:551.507.1

Hartley, G. E. W., **Transportable anemometer for use with mobile meteorological unit.** *Great Britain. Meteorological Research Committee, M.R.P.* 908, Feb. 8, **1955.** 2 p. 2 figs. Mimeo. **DWB**—For use with a trailer a light alloy ladder 32 ft long weighing 91 lb was adopted after trials. It is hinged to an anchored base and guyed. A standard cup generator nemometer and vane are attached to the top. It takes 5 men 40 min to erect. As an alernative a 30 ft sectional tower has advantages. *Subject Headings:* **1. Portable anemometers 2. Mobile weather stations.**—*C.E.P.B.*

6.7–130 551.508.54

Cox, W. J. G., **A cup-type transmitting anemometer with improved response to decreasing gusts.** *Farnborough, England. Royal Aircraft Establishment, Technical Note, No. Instn.* 140, July **1954.** 4 p. 10 figs., 4 refs., 58 eqs. Mimeo. **DNACA**—The anemometer generates a voltage roughly proportional to air speed. When speed is decreasing a damping brake comes nto operation, minimizing tendency to free-wheel. Schematic diagram is given and theory of motion is set out in detail. *Subject Heading:* **1. Anemometers.**—*C.E.P.B.*

6.7–131 551.508.54

Hawkins, A. E., **A simple vane anemometer giving continuous and direct indication of wind velocity.** *Journal of Scientific Instruments*, 31(11):404–405, Nov. **1954.** 3 figs. **DLC**— A sensitive portable inexpensive instrument was constructed by using the shaft of a vane anemometer as a rotary switch causing a condenser to charge and then discharge through a microammeter. Construction and calibration are described. *Subject Heading:* **1. Anemometers.**—*C.E.P.B.*

6.7–132 551.508.54

†Ripken, John F., **Survey of measuring instruments for low-velocity winds.** Minnesota. Univ. St. Anthony Falls Hydraulic Laboratory, Contract DA-11-022-ORD-1048, and Contract DA-36-039-SC-56694, Project Report No. 40, Dec. **1953.** 130 p. 53 figs., refs. **DWB**—The nature of wind structure near the ground is discussed analytically from the point of view of ordnance-firing, followed by a treatment of measurement problems in general, and then of characteristics of various types of pressure anemometers; thermal anemometers (which are considered to be the most promising), ionization anemometers; sonic phasemeter, vortex trail, visual and tracer systems of measuring winds and, finally, directional measuring equipment. In each type or subtype the instruments are discussed, illustrated, calibration curves and comparative data given, and fairly extensive lists of references appended. Accuracy, sensitiveness and transmissiveness of the sensory device, the teletering system (if any) and other field problems are treated. *Subject Headings:* **1. Anemometers 2. Wind instruments 3. Instrument surveys.**—*M.R.*

6.7–133 551.508.71

Morris, Vernon B. and Sobel, Frederick, **Some experiments on the speed of response of the electrolytic hygrometer.** *American Meteorological Society, Bulletin*, 35(5):226–229, May **1954.** fig., table, 3 refs., 2 eqs. **MH-BH**—It is shown that "for a fixed increase (or

decrease) in relative humidity, the response of the hygrometer must be slower at higher humidities." The rate of response of the hygrometer varies inversely with the saturation vapor pressure and is almost independent of the temperature. The dependence of speed of response on duration of change of humidity is explained by the process of diffusion within the hygroscopic film. The speed of response improves at lower pressures. The most advantageous orientation of the humidity element is that which produces the maximum turbulence. *Subject Headings:* **1. Hygrometers 2. Hygrometer lag 3. Humidity effects.**—*I.L.D.*

6.7–134 551.508.8

Sauberer, F., **Die Feuchteskala der Thermohygrographen.** [Humidity scale of the thermohygrograph.] *Wetter und Leben*, Vienna, 6(3/4):76 77, June **1954. MH-BH**—The specification requirements for the construction of thermographs, hygrographs and thermohygrographs in Germany and Austria and the reduction in size of the drums of the thermohygrograph without diminishing the accuracy of humidity registration are discussed. The specifications for the construction of a thermohygrograph for microclimatic readings are outlined briefly. *Subject Heading:* **1. Hygrothermographs.**—*I.L.D.*

6.7–135 551.508.822:551.501.7

Scrase, F. J., **The application of radiation and lag corrections to radio sonde temperatures.** *Great Britain. Meteorological Research Committee, M.R.P.*, 889, Nov. 19, **1954.** 3 p. 3 tables. Mimeo. **DWB**—Errors of a radiosonde due to radiation (short and long waves) and corrections for solar altitude and lag are evaluated and set out in tables. *Subject Heading:* **1. Radiosonde corrections.**—*C.E.P.B.*

6.7–136 551.508.94:621.396.11

König, Heinz, **Ein Impulsempfänger für atmosphärische Langwellenstrahlung.** [An impulse receiver for atmospheric long-wave radiation.] *Annalen der Meteorologie, Medizinmeteorologische Hefte*, No. 10:16–20, **1955.** 6 figs., 5 refs. **DWB**—The receiver consists of an amplifier with a wave band of 6–100 km to which 2 impulse counters are connected, able to record 100 impulses per sec of amplitude >0.005 or 0.1 V/m. The recording apparatus is also described. *Subject Heading:* **1. Long wave recorders.**—*C.E.P.B.*

6.7–137 551.508.95:551.510.42

Ficklen, Joseph B., III, **The konisampler (patent pending). 1954.** 4 p. photo., 10 refs. **DWB**—The Konisampler is a device for collecting dust, smoke or fume by the method of thermal precipitation which involves the drawing of air between a hot surface and a relatively cooler one and the deposition of the particulate matter upon a glass slide. The construction of the instrument and its mode of operation are described. A photograph of the Konisampler is presented. *Subject Headings:* **1. Air sampling instruments 2. Konisampler.**—*I.L.D.*

SYNOPTIC ANALYSIS AND FORECASTING

See also: **Tropical meteorology,** 6.7–2; **Stockholm Seminar Project** (Rossby), 6.7–78.

6.7–138 551.509.25

Wasko, Peter E., **Verification of prognostic maps prepared by means of the control-line method.** *American Meteorological Society, Bulletin*, 35(6):257–260, June **1954.** 3 figs., 2 tables, 2 refs. **MH-BH**—The author verifies 24– and 48–hour 500 mb prognostic maps, prepared on a current basis by means of the objective kinematic "control-line" method, with the aid of the respective actual maps. The measures of forecast performance were: correlation, mean-error and flight-index. In comparison with the persistence method, the control-line method yielded consistently good 24-hr and reasonably good 48-hr forecasts. *Subject Headings:* **1. Prognostic charts 2. Control-line method.**—*I.L.D.*

6.7–139 551.509.3

§Gressel, W., **Die Wetterentwicklung vom 6.–9. Mai 1954.** [Weather development, May 6–9, 1954.] *Wetter und Leben*, Vienna, 6(3/4):71–73, June **1954. MH-BH**—The spring of 1954 was characterized by a weather tendency consisting of repeated formation of pronounced meridional circulation with a frequent manifestation of positive pressure anomaly over northern Europe and low pressure activity in the Mediterranean region. But during May 6–9, 1954 this weather situation experienced a change which lasted for seven days. A detailed description of the synoptic features of the origin and persistence of this weather situation is given. *Subject Headings:* **1. Synoptic weather conditions 2. Meridional circulation 3. Northern Europe.** —*I.L.D.*

6.7–140 551.509.31

Kopcewicz, Teodor, **Méthode de prévision météorologique de 5 jours pour la Pologne.** [Method of 5-day meteorological forecasting for Poland.] *Acta Geophysica Polonica*, Warsaw, 2(1):18–54, **1954.** 10 figs., 2 tables, 17 refs. **DLC**—Presents detailed description of new and important modifications introduced during recent years in synoptic method of 5–7 day meteorological forecasting and their application to geographical conditions of Poland. Suggests possibility of practical utilization of mathematical, physical, statistical and synoptic methods of forecasting based on results of the Rossby school. Develops the kinematic method of meteorological forecasting and shows its application to conditions in Poland. Finally, the author classifies weather situations according to five patterns based on the zonal circulation index and describes the types of weather in Poland for each of these cases. *Subject Headings:* **1. Synoptic forecasting 2. Forecasting techniques 3. Poland.**—*A.M.P.*

6.7–141 551.509.31:517.51

Sherman, Leon, **A note on extrapolation.** *American Meteorological Society, Bulletin*, 35(5):234–235, May **1954.** 2 refs. **MH-BH**—The technique of DEFANT and WASKO of preparing forecast charts by extrapolation, applied by them to pressure charts, is extended to other fields. The extrapolation principle is as follows: if a continuous quantity x is to be forecast from a knowledge of three successive values x_0, x_1 and x_2 for the time 0, t and $2t$, it is permissible to assume a law of the form $x=a+bt+ct^2$. By substituting the successive pairs (x_0 0 . . .) in the above equation and solving for a, bt and ct^2 the latter can be introduced in the equation for the time $3t$ to yield $x_3=x_0+3(x_2-x_1)$. The application of this method is illustrated. *Subject Headings:* **1. Extrapolation 2. Forecasting techniques.**—*I.L.D.*

6.7–142 551.509.312:551.541:551.558.21

†Colson, DeVer (*U. S. W. B., Wash., D. C.*), **Meteorological problems in forecasting mountain waves.** *American Meteorological Society, Bulletin*, 35(8):363–371, Oct. **1954.** 15 figs., 7 refs. **MH-BH**—The standing-wave development to the lee of prominent mountain ridges presents not only an interesting meteorological phenomenon but also a definite hazard to certain aircraft operations. An analysis of the mountain-wave observations in the Sierras indicates the presence of strong winds normal to the mountain range as well as large vertical wind shears; and an inversion or at least a stable layer near the level of the mountain crest. Changes in the pressure and temperature patterns at both the surface and 500-mb level are shown for two examples of more intense wave developments. Also, mean surface and upper-level pressure and temperature patterns are shown for the strong-wave days. The association between these mean patterns and surface frontal movements, upper-level troughs, strong temperature gradients, and the jet stream are discussed. An example of the effect of wind shear and static stability is shown using equations and methods developed by SCORER. Data on the occurrence of mountain-wave activity in other mountainous areas of the West are now being collected. Two examples of these results are shown. *Subject Headings:* **1. Lee wave forecasting 2. Vertical shear 3. Aeronautical meteorology.**—*Author's abstract.*

6.7–143 551.509.33(676)

Sansom, H. W., **Prediction of the seasonal rains of Kenya by means of correlation.** *Weather*, 10(3):81–86, March **1955.** 2 tables, 3 refs. **DWB**—A prediction formula for the "long rains" of March–May in Kenya is obtained from Dec.–Feb. values of Cape Town

pressure, Alexandria pressure (negative) and Tabora rainfall. An expression is also found for "short rains" of Oct.–Dec. Results of 5 predictions are set out; they all indicated whether rainfall would be above or below average over Kenya as a whole. *Subject Headings:* **1. Long range forecasting 2. Kenya.**—*C.E.P.B.*

6.7–144 551.509.5:551.578.7

*Fawbush, Ernest J. and Miller, Robert C. (*Tinker Air Force Base, Okla.*), **A method for forecasting hailstone size at the earth's surface.** *American Meteorological Society, Bulletin,* 34(6):235 244, June **1953.** 15 figs., 4 tables, 8 refs. **MH-BH**—An objective study of conditions favorable for hailstorms reveals that great convective instability (dry air over a moist layer) is necessary for production of large hail. The study embraced results of 274 soundings divided into 11 categories of hailstone size (from $\frac{1}{8}''$ to 4''). Of all the parameters plotted against hailstone size, the Showalter Instability Index gave the smoothest and most significant relationship. Height of wet-bulb freezing level is also critical—a height of 8000 ft above terrain appears to be the optimum. If too high the hailstones melt to some extent. The authors have constructed and presented a hail graph which is based on uprush speeds (according to HUMPHREYS data). The variables depend on moisture content and temperature lapse rate. The theoretical graph was revised after plotting the results of the 274 soundings. Verification is difficult because of indefinite reports of hailstone size and the very local character of all hailstorms compared to synoptic network. *Subject Headings:* **1. Hailstone size forecasting 2. Hail forecast graphs 3. Showalter's Instability Index 4. Objective forecasting.**—*M.R.*

6.7–145 551.509.5:629.13

Forecasting for long-distance flights. *Meteorological Magazine,* London, 84(993):79–89, March **1955.** 3 figs. **DWB**—T. N. S. HARROWER opened with a detailed account of the operational and forecasting procedures at London Airport for flights exceeding 1000 naut. mi, especially transatlantic flights, including briefing of crews and amendments during flight. Forecasting for a flight from London to Gander is used as an example. Difficulties of terminal forecasting are described. In an excellent discussion speakers elaborated various points including work in preparation for Comet III high-level transatlantic flights and practical details from the point of view of BOAC officers. *Subject Headings:* **1. Airways forecasting. I. Harrower, T. N. S.**—*C.E.P.B.*

6.7–146 551.509.5:629.13

George, Joseph J. et al, **To develop empirical objective methods of forecasting surface synoptic features for periods up to 48 hours through use of upper air and surface parameters.** Eastern Air Lines, Inc., Atlanta, Georgia, Contract AF 19(122)-468, Short Range Forecasting Project, Final Report, [**1954**] 8 p. refs. **MH-BH**—The results of the project to develop improved methods for forecasting meteorological parameters for operational use are summarized. A method for predicting cyclogenesis 12–24 hours in advance of its formation was formulated; this method is based upon "an injection of cold air at 850 mb." The prediction of the track, speed and future intensity for a 30-hour period for arbitrarily established categories of cyclones was accomplished. A method for predicting the future 30-hour position of polar anticyclones was developed. A system for predicting the average movement of various points of a cold front 30 hours in advance was introduced. Rules for warm frontogenesis were formulated and the prediction of warm frontal movement 12 hours in advance was accomplished. The forecasting of squall line formation was developed. The applicability and the accuracy of these methods is discussed. *Subject Headings:* **1. Objective forecasting 2. Short range forecasting 3. Cyclogenesis 4. Aeronautical meteorology.**—*I.L.D.*

6.7–147 551.509.5:632.187

§*Krumm, W. R. (*Fire Weather Meteorologist, Missoula, Montana*), **An explanation of meteorological conditions which probably caused unexpected behavior of the Rattlesnake fire, Mendocino National Forest, July 9, 1953.** (Wash., D. C., U. S. Weather Bureau, Feb. 9, **1954**). 35 p. 17 figs., ref. "Initial draft." **DWB**—After a thorough study of the local and general meteorological and synoptic conditions prevailing at the time this "blow up" fire

changed from upslope to downslope propagation (10 p.m. on July 9, 1953) trapping and killing 15 fire fighters, the author concludes that the situation, while frequent, is not normal. The opinion that the change in wind was the usual change from upslope to downslope winds known as mountain-valley breezes, due to radiational changes, is questioned. Offers the alternative hypothesis that the winds were very dry subsiding winds due to high pressure against the Coastal Ridge, supported by surface, 850 mb and 700 mb synoptic charts for the West and radio soundings. Although a hindcast, hints are given for forecasters. *Subject Headings:* **1. Fire weather forecast studies 2. Fire weather conditions 3. Mendocino National Forest, Montana.**—*M.R.*

6.7–148 551.509.5:551.515.3/4

Showalter, A. K., (*WBAN Analysis Center, Wash., D. C.*), **A stability index for thunderstorm forecasting.** *American Meteorological Society, Bulletin*, 34(6):250–252, June **1953.** 2 figs., 3 refs. **MH-BH**—The history of the Showalter Stability Index, its calculation and usefulness in forecasting thunderstorms is outlined, and it is compared with the Gardner-Scherhag Instability Index (which is calculated in the same way only with reversal of sign + or −). In both cases, the parcel of air is lifted adiabatically from 850 mb to saturation and then pseudo-adiabatically from there to 500 mb and the difference between the lifted temperature and the observed used as the index. In the Showalter Index a value of +6°C would be very stable and one of −6° or −8° would indicate probability of a violent storm or tornado. A new Index—the Showalter Tornado Index is described and its use with the Stability Index illustrated. It consists of θ at top of moist layer, $-\theta$ at wet-bulb zero level, in whole degrees (°A). Check on spring 1952 cases shows probability of tornadoes if 0° or— Tornado Index coincides with area of 0° or—Stability Index. *Subject Headings:* **1. Showalter's Stability Index 2. Showalter's Tornado Index 3. Gardner-Scherhag Instability Index 4. Tornado forecasting 5. Thunderstorm forecasting.**—*M.R.*

6.7–149 551.509.53/4

Manohin, V. (*Ljubljana*), **Prognose für den Sommer 1954.** [Forecast for the summer of 1954.] *Wetter und Leben*, Vienna, 6(3/4):74–76, June **1954. MH-BH**—An analysis of the 100 year weather data for Ljubljana indicates that the summer rainfall and temperature show no regular rhythm. The rainfall and the temperature variation for the period June–Aug. show symmetry points, with the aid of which the author attempts to forecast the temperature and rainfall for the summer of 1954. *Subject Headings:* **1. Rainfall forecasting 2. Temperature forecasting 3. Ljubljana, Yugoslavia.**—*I.L.D.*

6.7–150 551.509.54:551.577.37

Erikson, Carl E., **Synoptic characteristics of excessive rainfall.** U. S. Weather Bureau, [1954?] 5 p. 2 refs. carbon of typescript. **DWB**—Eight synoptic criteria were tested for significance in production of excessive rainfall, using data for 11 storms in the U. S. (charts for 5, 10, 15 and 20 thousand ft. levels or corresponding constant pressure levels, were used). It was found that the presence of warm geostrophic advection, and its negative Laplacian (warm-max-type), and positive Laplacian (Fall-max-type) of isallobars gave verification in 9 or 10 out of 11 cases, whereas other criteria gave poorer results. "Cold air to the West" gives good correlation in winter, but no winter cases appeared in this study so results of this test were not conclusive. *Subject Headings:* **1. Objective forecasting 2. Excessive rainfall forecasting 3. Warm air advection.**—*M.R.*

6.7–151 551.509.62:551.521.32

Gilman, C. S. (*U. S. W. B., Wash., D. C.*), **Suggestions for a coordinated program to study differential advection as a "Predictor" of precipitation and other meteorological features.** *American Meteorological Society, Bulletin*, 35(5):214, May **1954. MH-BH**—The suggestions prepared are as follows: simultaneous relations, prognostic relations (pressure forecasts on the basis of Analysis Center Charts and a better 12-hour prognostic), thermal gradient forecasts, application of life history concept to advection areas and mathematical study of the dynamics of different advections. *Subject Headings:* **1. Differential advection 2. Precipitation forecasting 3. Prognostic charts.**—*I.L.D.*

6.7–152 551.509.54:551.511

Bensin, Basil M., **Coal dust for Alaskan gardens.** Privately printed by the author, **1952.** 9 p. 12 figs., 4 refs., table.—The use of dry coal dust, which absorbs, retains and radiates solar heat ten times more than the average soil, for modifying the microclimate is discussed. The author considers the use of coal dust for snow removal, for growing garden crops, and for growing warm season vegetables with garden solar reflectors. *Subject Headings:* **1. Coal dust absorption 2. Absorption of terrestrial radiation 3. Artificial influences 4. Snow melt 5. Agricultural climatology 6. Alaska.**—*I.L.D.*

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

COMPOSITION OF THE ATMOSPHERE

See also: **Konisampler** (Ficklen), 6.7–137; **Nitrogen content of precip.** (Herman), 6.7–268.

6.7–153 551.510.4:523.45

Lorenz, Edward N., **The vertical extent of Jupiter's atmosphere.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers,* No. 24:123–127, Nov. **1953;** *AFCRC Technical Report,* 53 35. 2 figs., 3 refs. **DWB, DLC**—Because the magnitude of the temperature contrast between the "equatorial bulge" and the extratropical atmosphere is not known, the winds cannot be estimated accurately and the depth of the atmosphere computed with any degree of certainty. However an estimate of 2% variation in absolute temperature across this discontinuity would give a depth of 110 km below the visible surface. This estimate is probably of the right order of magnitude. The atmosphere on Jupiter probably extends farther above the visible surface than the earth's atmosphere extends above sea level. *Subject Headings:* **1. Planetary atmospheric depth 2. Jupiter 3. Planetary atmospheres.**—*M.R.*

6.7–154 551.510.41:546.26

*Benesch, W.; Migeotte, M. and Neven, L., **Sur l'abondance du monoxyde de carbone tellurique au Jungfraujoch, Suisse.** [The amount of telluric carbon monoxide on the Jungfraujoch, Switzerland.] *Journal de Physique et le Radium,* Paris, 15(13):213–215, March **1954.** 2 figs. **DLC**—Amounts of carbon monoxide in the atmosphere were determined from spectrograph data obtained at Jungfraujoch (3580 m) in 1950 and 1951. General results are presented for selected days. Variations of atmospheric CO were compared with various meteorological factors (frontal passages, air masses, air trajectories) and no correlation was found. It is therefore suggested that "cells" of CO exist in the atmosphere; these cells would originate in certain confined areas and propagate through the atmosphere, reaching the observation site before they are diluted. *Subject Headings:* **1. Carbon monoxide in the atmosphere 2. Jungfraujoch, Switzerland.**—*G.T.*

6.7–155 551.510.41:546.264

Cotton, C. A., **Terrestrial carbon.** *New Zealand Science Review,* Wellington, 12(3/4): 54–55, March/April **1954.** 3 refs. **DLC**—The author maintains the theory that atmospheric CO_2 is the result of slow continuous emission from the body of the earth, from volcanoes, fumaroles and hot springs. Arguments are presented against the theory that most of the carbon in the world was present at once as CO_2 in the atmosphere of early geological times. *Subject Headings:* **1. Carbon dioxide in the atmosphere 2. Terrestrial carbon.**—*I.L.D.*

6.7–156 551.510.41:546.214

Harteck, P. and Dondes, S. (*both: Rensselaer Polytechnic Inst., Troy, N. Y.*), **Comments on the thermal decomposition of ozone.** *Journal of Chemical Physics,* N. Y., 21(12):2241, Dec. **1953.** 2 refs. **DWB**—Disagreement of experimental with theoretical data on the spontaneous thermal decomposition of small amounts of O_3 in large amounts of O_2 is explained on the basis of oxygen recombination and O_3 catalysis on the walls of the experimental reaction chamber. This was proven by increasing surface area of chamber 100 fold by the addition

of glass wool (reaction increased 3 to 4 times as fast due to recombination of oxygen atoms in surface of glass wool). A correction should also be made for heat released by decomposition of O_3 in initial stages raising temperature in gas. *Subject Heading:* **1. Ozone decomposition.** —*M.R.*

6.7–157 551.510.41:546.214

Wulf, Oliver Reynolds (*U. S. W. B., Pasadena*) and Zimmerman, James E. (*Astrophysical Obs., Smithsonian Inst., Table Mt., Calif.*), **A method for the measurement of atmospheric ozone using the absorption of ozone in the visible spectrum.** *Smithsonian Miscellaneous Collections*, Washington, D. C., 123(3), Oct. 27, **1954.** 14 p. 5 tables, refs., 17 eqs. *Smithsonian Institution, Publication*, No. 4177. **DWB**—An analytical method has been developed for computing the vertical-path of atmospheric ozone from the measurements of atmospheric transmission coefficients at several wavelengths across the visible spectrum using the absorption of ozone in this region. In the computational procedure a large part of the calculations is carried out once and for all, the evaluation of the ozone corresponding to any one set of observations being a relatively small matter. The method also yields information concerning atmospheric haze. The optical densities corresponding to the measured transmission coefficients are represented in the present work by four terms. Two of these are the scattering by the molecules of the air and the absorption by ozone. The other two represent the scattering by haze, one a wavelength-independent portion, and the other a term in the square of the reciprocal of the wavelength with unknown coefficient. The values of this coefficient and of the wavelength-independent scattering, in addition to the ozone path, are given by the calculations, and constitute information on the character of the optical density of the haze. *Subject Headings:* **1. Ozone measurement techniques 2. Ozone absorption 3. Transmission coefficients.**—*Author's abstract.*

ATMOSPHERIC POLLUTION

6.7–158 551.510.42:628.53

Air pollution. *Nature*, London, 175(4453):399, March 5, **1955.** ref. **DWB**—Summary and discussion of the Report of the Committee on Air Pollution. *Subject Heading:* **1. Smoke abatement.**—*C.E.P.B.*

6.7–159 551.510.42:546.214

Blewett, Stephen E. (*Dir. Air Research Associates*), **Smog. What is it? Why is it? A scientific analysis of one of California's most serious problems.** *Fortnight*, Los Angeles, 17(11):11–26, Dec. **1954.** port., photos., tables, 23 refs. **DLC**—An entire issue of **Fortnight** is devoted to an elaborate report by Blewett on the real and supposed causes of the smog and its harmful effects, as experienced in the Los Angeles area. The thesis is that the O_3 and NO_2, which produce the irritation to eyes and respiratory membranes, comes from the stratosphere off the California coast and not from the urban area, and that by removing smoke and sulfur products from the air the bad effects are increased since the sulfides actually react with the O_3, etc., to reduce the amount available for acting on human beings or oxidizable materials. Tests made at various levels in the area, and relation to wind direction, stability of the air, etc., are cited quantitatively and discussed. Many pictures of smog and smogless situations are included. *Subject Headings:* **1. Smog research 2. Ozone near the ground 3. Los Angeles, Calif.**—*M.R.*

6.7–160 551.510.42 628.53

The Beaver report. A review of the discussion. The report and public opinion. *Smokeless Air*, No. 93:134–137, Spring **1955.** Also: Beaver, Sir Hugh, **Clean air.** *Ibid.*, 145–149. **DWB**—1. The discussion of the Beaver report on smog prevention was on the whole very favorable both in Parliament and by the public press. 2. A Chadwick Trust lecture by Sir Hugh Beaver on Feb. 14, 1955, on his Report. It deals with water and gaseous pollution, especially the effect of sulfur. *Subject Headings:* **1. Atmospheric pollution 2. Smoke abatement.**—*C.E.P.B.*

6.7–161 551.510.42:629.113

Fitton, A., **Air pollution from road vehicles.** *Smokeless Air*, no. 93:152–154, Spring **1955. DWB**—The composition of exhaust gases of petrol and diesel engines is examined and compared with toxic limits and flue gases. The problems in London and Los Angeles are compared. Possible improvements in fuel and in cleaning exhaust gases are discussed. *Subject Headings:* **1. Atmospheric pollution 2. Exhaust gases.**—*C.E.P.B.*

6.7–162 551.510.42:551.507.321

*Walstrom, A. W. (*U. S. W. B., Cincinnati*), **Results of Operation Meteor XIOO.** Wash., D. C., U. S. Weather Bureau, April 16, **1954.** 32 p. Mimeo. **DWB**—In each of 33 industrial cities of the U. S., 10 helium filled balloons were released on the same day (Oct. 19, 1953) with tags attached to instruct finders to return the balloons. Only 47 were found and returned, and the locations of these finds, date, distance and direction from each of the 18 stations from which released were tabulated. No returns were obtained from 15 of the stations (in coastal or mountain areas). Due to light winds, 9 of the 10 released at Minneapolis were returned the same day, 6 from the city itself, but one from 90 mi away. This indicates stagnant conditions which increase air pollution over cities even when turbulence carries dust and smoke upward. Great variability indicated by one found 600 mi from source. *Subject Headings:* **1 .Balloon dispersal 2. Atmospheric pollution surveys 3. United States.**—*M.R.*

UPPER ATMOSPHERE—IONOSPHERE

See: **Solar flares** (Ferraro), 6.7–27; **Use of barometric height** (Godart), 6.7–221.

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE

See also: **Predictor of precip.** (Gilman), 6.7–151.

6.7–163 551.511:533.17

Grodzovskiĭ, G. L., **Vyravnivanie neravnomernosti polia skorosteĭ v osesimmetrichnom turbulentnom i laminarnom potoke.** [Smoothing out the inequalities of the velocity field in axially symmetrical turbulent and laminar flow.] *Akademiia Nauk SSSR, Doklady*, 97(4):613 616, Aug. 1, **1954.** 3 figs., 4 refs., 10 eqs. **DLC**—It is demonstrated that in axially symmetrical turbulent flow the unevenness of the longitudinal velocity is smoothed out as inversely proportional to the distance along the axis of symmetry and that the profile of velocity is determined by the Bessel function J_0 and the maximum unevenness is near the axis of flow. Both in laminar and axially symmetrical flow the intensity of the smoothing out of the velocity field is practically the same. The equations for the velocity profile of laminar axially symmetrical flow as well as for turbulent flow are given. *Subject Headings:* **1. Turbulent flow 2. Laminar flow.**—*I.L.D.*

6.7–164 551.511:551.551

Marris, A. W. (*Univ. of British Columbia, Vancouver, B. C.*), **Momentum and vorticity transfer theories of turbulent heat transfer.** *Canadian Journal of Physics*, Ottawa, 32(6):419–429, June **1954.** 3 figs., 7 refs., eqs. **DWB**—The case of heat transfer by a cylindrical turbulent region is examined further theoretically from the standpoint of the vorticity transfer analogy. The radial distribution of the eddy diffusivity for vorticity is considered and, on the logarithmic velocity distribution law for fully developed turbulence, this quantity is ound to be negative throughout an interval at the outer boundary of the turbulent region. When this region is excluded from the relevant integrals, results are obtained for the Nusselt modulus and radial temperature distribution for the particular case of Prandtl number equal to the ratio of the eddy diffusivities for vorticity and heat, and are compared with the corresponding results on the momentum transfer analogy theory. *Subject Headings:* **1. Turbulent transfer of heat 2. Vorticity theory 3. Momentum transfer.**—*Author's abstract.*

6.7–165 551.511:551.551:551.543

Ogura, Y. and Miyakoda, K. (*Geophys. Inst., Tokyo U.*), **Note on the pressure fluctuations in isotropic turbulence.** *Meteorological Society of Japan, Journal*, 2nd Ser., 32(5/6):160–166, May/June, **1954.** figs., 11 refs., 31 eqs. **MH-BH**—The spectrum of pressure fluctuations in isotropic turbulence is theoretically analyzed on the assumption that the joint probability distribution of turbulent velocities is normal, and making use of an approximate representation for the interrelation between the longitudinal velocity correlation and the velocity spectrum. The three-dimensional pressure spectrum $II_*(k)$ thus derived is: $II_*(k) \sim k^{-7/3}$ for the intermediate wave-number range and $II_*(k) \sim k^2$ for the low wave-number range, corresponding to the velocity spectra $F_*(k) \sim k^{-5/3}$ and $F_*(k) \sim k$, respectively. These theoretical results are compared with the pressure spectra observed in the zone of westerlies in the middle latitudes with fairly good agreement. *Subject Headings:* **1. Isotropic turbulence 2. Pressure fluctuations.**—*Authors' abstract.*

6.7–166 551.511:551.551

Ogura, Y. and Miyakoda, K. (*Geophys. Inst., Tokyo U.*), **The theory of three-dimensional turbulent diffusion.** *Meteorological Society of Japan, Journal*, 2nd Ser., 32(5/6):143–159, May/June, **1954.** 9 figs., 8 refs., 56 eqs. **MH-BH**—The three-dimensional diffusion of minute particles emitted from a point source is discussed in connection with the energy spectrum of isotropic and homogeneous turbulence. It is shown that the shape of the diffused cloud near the source is controlled solely by the energy spectrum in the intermediate wave-number range. Moreover, an approximate representation for statistical quantities which appear frequently in the turbulence theory is presented. *Subject Headings:* **1. Turbulence theory 2. Turbulent diffusion.**—*Authors' abstract.*

GENERAL CIRCULATION

See also: **Atmospheric circulation,** 6.7–3; **Singularities** (Rebman), 6.7–207.

6.7–167 551.513

Mintz, Yale (*Dept. of Met., Calif. Univ. at L. A.*), **The observed zonal circulation of the atmosphere.** *American Meteorological Society, Bulletin*, 35(5):208–214, May **1954.** 3 figs., refs., p. 213–214. **MH-BH**—Using the available published circumpolar maps of time-averaged pressure and winds at several levels in the troposphere and lower stratosphere and of vertical cross sections of the time-averaged zonal component of the wind at different longitudes the author found "a composite picture of the normal (time-averaged) zonal circulation from pole to pole and from sea level to the 5-centibar level, in summer and in winter." The Northern Hemisphere polar easterlies and westerlies, the tropical and equatorial easterlies, the Southern Hemisphere westerlies and the Antarctic easterlies are described. *Subject Headings:* **1. Zonal circulation 2. Easterly waves 3. Waves in the westerlies 4. Northern Hemisphere 5. Southern Hemisphere.**—*I.L.D.*

6.7–168 551.513

Wahl, Eberhard W., **Changes in the general circulation reflected in the occurrence and intensity of weather singularities.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 24:129–141, Nov. **1953;** *AFCRC Technical Report* 53-35. figs., 9 refs. **DWB, DLC**—The occurrence and the intensity of singularities appear to be closely related to the state of the general circulation. Utilizing the mean sea-level zonal westerly index as a parameter for the intensity of the general circulation, it can be shown that in various regions distinct differences exist between singularities in low and high index months. Furthermore, this hypothesis explains the observed changes in intensity of several well-known singularities during the last century. *Subject Headings:* **1. Singularities 2. Atmospheric circulation.**—*Author's abstract.*

6.7–169 551.513:551.578.46

Wahl, Eberhard W. (*Air Force, Cambridge Research Center*), **A weather singularity over the U. S. in October.** *American Meteorological Society, Bulletin*, 35(8):351–356, Oct. **1954.**

5 figs., 5 refs. **MH-BH**—The sharp increase in snow probability occurring during Oct. at Denver, Colo., is shown to be the local effect of an extensive weather singularity which influences the whole central part of N. America and which can be associated with a major circulation singularity. Using the climatological data for Denver, North Platte and St. Paul, the author determines the probability of snow occurrence and the frequency of cold days in the fall and then analyzes on the basis of 40 years of record the sea level pressure pattern for the U. S. in Oct. and autumn to show the synoptic development of this singularity. *Subject Headings:* **1. Singularities 2. Circulation type singularities 3. Snow probability 4. United States.**—*I.L.D.*

6.7–170 551.513.1

Lighthill, M. J., **An elementary reasoned account of the general circulation of the atmosphere.** *Philosophical Magazine*, 7 ser., 45(370):1154–1162, Nov. **1954.** 5 refs., 8 eqs. **DWB**—The tendency to strong westerly winds in the upper troposphere with a mean velocity about 20 m/s is due to a pressure gradient of 50 mb equator to poles at 300–400 mb, which in turn is related to sea-level temperature gradient. The calculated quantities are of the right order of magnitude. At the surface there is a loss of angular momentum in the west wind belts made up by a gain in the east wind belt of lower latitudes. This poleward flow of angular momentum reaches a maximum of about 1.6×10^8 dynes near lat. 30°. It is due partly to poleward winds down the pressure gradient in the upper troposphere but in the cyclone belt the transport is largely by the cyclones themselves. *Subject Heading:* **1. Atmospheric circulation theory.**—*C.E.P.B.*

6.7–171 551.513.2:551.557

McClellan, D. E., **Jet stream analysis.** *Canada. Meteorological Division, Cir.* 2425 Tec. 179, Feb. 1, **1954.** 9 p. 3 figs., 7 refs. **DWB**—A method for drawing isotachs on the constant pressure chart, particularly for cases of high winds when the ascent ends before the level of the highest winds are reached. It is based upon a variation of the principle by which the orientation of a cross section to portray a jet stream is selected such that the cross section is normal to the wind flow at 500 mb, so that the revolution of the wind speeds to make them consistent with the temperature field is eliminated. It is assumed that the wind at 500 mb is parallel to the wind at 300 mb. The drawing of the isotachs is described and the relation between jet stream and frontal pattern is discussed. An example of the 300 mb chart together with the 500 mb and the thermal chart for the layer from 500 to 300 mb is attached. *Subject Headings:* **1. Jet stream analysis 2. Upper air winds 3. Isotach analysis.**—*I.L.D.*

6.7–172 551.513.2:551.557(265)

§*Serebreny, Sidney M.; Wiegman, Eldon J. and Carlson, Wilbur F., **Characteristic properties of the jet stream over the Pacific, Case history No. 2, Pt. 1.** Pan American World Airways, Inc., Pacific-Alaska Div., Meteorology Dept., Contract N189s-96835, Technical Report No. 2, March **1954.** 186 p. 106 figs., 3 tables. **DWB**—A detailed and thorough analysis of the characteristics of the jet stream over the Western Pacific for the period Feb. 25 through March 5, 1953, based upon selected aircraft in-flight reports and relevant synoptic data. The discussion included the distribution of upper winds at selected stations, mean positions of the jet stream, relationship of the jet stream to surface synoptic patterns, distribution of temperature over Japan, histograms of temperature for stations along selected longitudes, relationships between polar and subtropical jet streams, vertical distribution of west wind components along selected longitudes, distribution of winds, fronts and isotherms over selected stations, distribution of west wind components and lapse rates. The synoptic data and aircraft in-flight weather reports are given. *Subject Headings:* **1. Jet stream analysis 2. Pacific jet stream 3. Synoptic aerological studies 4. Western Pacific.**—*I.L.D.*

6.7–173 551.513.2:551.557

§*Serebreny, S. M. and Wiegman, E. J. (*Met. Section, Pan American World Airways, Pacific-Alaska Div.*), **Certain characteristic features of the jet stream and their application to airline operations. 1954?** 37 p. 20 figs., 4 refs. **DWB**—Models of the jet stream—wind and jet stream—temperature fields are presented in cross section form showing relation

to fronts and air masses. The average width of the jet stream over the Pacific was found to be 250 miles at 500 mb and 400 miles at 400 mb level. Relation of vertical wind shear to stability was found to be marked, and quantitative data are presented in support of this. The importance of steep horizontal temperature gradients is also stressed, and the non-uniform spacing of isotherms in vicinity of the jet stream is emphasized. Synoptic examples (cross sections, surface and upper level synoptic charts and time-diagrams), for 1953 situation over the Western Pacific are presented and discussed. Hints or rules for forecasting are set forth. *Subject Headings:* **1. Jet stream forecasting 2. Jet stream structure 3. North Pacific.**—*M.R.*

6.7–174 551.513.2:551.515.8:551.557

Vederman, Joseph (*U. S. W. B. Analysis Center, Wash., D. C.*), **The life cycles of jet streams and extratropical cyclones.** *American Meteorological Society, Bulletin*, 35(6):239–244, June **1954.** 10 figs., 10 refs. **MH-BH**—An idealized model of the life cycle of the polar front jet stream and its frontal system is proposed. The various stages of the development of the idealized model, which is based upon various concepts developed by Palmén are shown in diagrams, and actual occurrences of jet streams and surface cyclonic frontal systems analyzed by Murray and Johnson (*QJRMS*, v. 78, April 1952; *see* 3.8-6, Aug. 1952, *MAB*) is compared with the idealized model. *Subject Headings:* **1. Jet stream models 2. Polar fronts 3. Frontal analysis.**—*I.L.D.*

ATMOSPHERIC DISTURBANCES

See also: **Tropical met-gy,** 6.7–2; **Stability index** (Showalter), 6.7–148; **Jet stream cyclones** (Vederman), 6.7–174; **Nature of summer dry winds** (Evseev), 6.7–231; **Winds aloft** (Eriksson), 6.7–242; **Front. type precip.** (Këri, Szakacs), 6.7–266.

6.7–175 551.515:550.34

Das Gupta, Sushil Chandra, **Note on microseisms produced on the surface of the earth due to storm in the deep sea.** *Naturwissenschaften*, 42(5):119, March 1, **1955.** 4 refs. **DWB**—Calculations are described showing that microseisms can be due to a travelling disturbance generating periodic waves on the sea, causing pressure variations on the sea floor. *Subject Heading:* **1. Microseisms.**—*C.E.P.B.*

6.7–176 551.515:551.541

Donn, William; Romer, Richard; Press, Frank and Ewig, Maurice, **Atmospheric oscillations and related synoptic patterns.** *American Meteorological Society, Bulletin*, 35(7):301–309, Sept. **1954.** 12 figs., 10 refs. **MH-BH**—A study of microbarovariograph records obtained at Palisades, N. Y., Kings Point; L. I., indicates that characteristic passive patterns are associated with particular synoptic situations, such as pressure jump lines, squall lines, cold fronts and thunderstorms. Short period pressure variations reflect low level turbulence or convection associated with certain air masses. Both the microbarovariograms and the relevant synoptic situations are shown and analyzed. *Subject Headings:* **1. Atmospheric oscillations 2. Synoptic patterns 3. Microbarovariographs.**—*I.L.D.*

6.7–177 551.515:550.342

Scholte, J. G. J., **Microseismen.** [Microseisms.] (In: Netherlands. (K.) Meteorologisch Instituut, **1854 Koninklijk Nederlands Meteorologisch Instituut, 1954.** 'S-Gravenhage, **1954.** p. 419–429. 6 figs., 5 refs., eqs.) **DWB**—The detailed investigation of BERNARD has proved that many of the observed microseisms are caused by storms occurring over the oceans far from the coasts ("typhoon effect" of ALGUÉ). As the amplitude of gravitational waves decreases exponentially with the depth the disturbance at the surface of the sea must be transmitted to the bottom by elastic-displacements. It is therefore adequate to consider a purely elastic system consisting of a body with the properties of the suboceanic rock covered by a liquid layer of finite depth. In this paper the movement of the sea floor caused by a concentrated force on the surface has been calculated. It appears that at large distances γ from the center of disturbance the main part of this motion is a kind of Rayleigh wave with an amplitude that is proportional to $\gamma^{-\frac{1}{2}}$ and that depends in a more intricate way on the depth,

measured in wave-lengths. Fig. (5) shows a sharp maximum for each mode; this organ pipe effect is obviously essential for the transmission of the energy from the surface to large distances. *Subject Headings:* **1. Microseisms 2. Rayleigh waves.**—*Author's abstract.*

6.7–178 551.515:539

Steinhauser, Ferdinand, **Atomenergie und Weltwetter.** [Atomic energy and world weather.] *Universum*, Vienna, 9(16):481–488, Aug. 2, **1954.** 3 figs., cover photo. Also his: **Atombombenexplosionen und Wettergeschehen.** [Atom bomb explosions and weather phenomena.] *Universitas*, Stuttgart, 9(11):1189–1196, Nov. **1954.** Abstracted from reprint. **DWB**—Atomic blasts will not affect large-scale weather development. This is supported by general data showing that: 1) the order of magnitude of energy released in thermonuclear explosions is insignificant compared with that involved in large-scale atmospheric processes, 2) the energy supply from explosions is instantaneous and therefore cannot influence a continuous process like weather development, 3) the world-wide rainfall amount cannot be permanently increased by a supply of condensation nuclei (supposedly provided by atomic explosions) because (a) there are usually enough condensation nuclei present in the atmosphere, (b) the mere presence of sufficient condensation nuclei does not produce precipitation and (c) increased precipitation would have to be balanced by increased evaporation; which is not done by atomic explosions. As to planned weather modification, the author believes that this could be achieved by slow rather than explosive release of thermonuclear energy. He leaves open the question whether such a weather modification plan would be practical and desirable. *Subject Headings:* **1. Atomic explosion effects 2. Grosswetterlagen 3. Weather modification 4. Condensation nuclei.**—*G.T.*

6.7–179 551.515.11

§Desai, B. N., and Rao, Y. P., **The severe Nagapattinam cyclones of 30 November 1952.** *Indian Journal of Meteorology and Geophysics*, 5(2):200–201, April **1954.** fig., table, 5 refs. **MH-BH**—The authors take issue with Rao and Sen's (*Current Science*, 22:98–102, **1953**) discussion of the Nagapattinam cyclones of 30 Nov. 1952. Synoptic charts indicate that a depression had formed already on Nov. 26 and not on Nov. 27. The formation of the depression and its subsequent intensification into a cyclone occurred in the absence of *Tc* air in the field of the disturbance and the "Triple Point" was between *TcTm*, *Tm* and *Em* air masses and not between *Tc*, *Tm* and *Em* air masses as assumed by Rao and Sen. *Subject Headings:* **1. Cyclone, Nagapattinam, India (Nov. 1952) 2. Cyclone development 3. Air masses.**—*I.L.D.*

6.7–180 551.515.2:551.46:551.551

Gherzi, E., **Peculiar stratified shape of typhoon waves.** *Nature*, London, 175(4450):310, Feb. 12, **1955.** **DWB**—Wave fronts 10–15 ft high in Kobe Bay showed a steady step structure. This may be due to higher harmonics of the period of typhoon squalls, which also cause the screaming of the wind. *Subject Headings:* **1. Typhoon waves 2. Typhoon wind structure 3. Kobe Bay, Japan.**—*C.E.P.B.*

6.7–181 551.515.2(74)

Ludlum, David M. (*ed.*), **Weatherwatch. Heat and hurricanes mark the fall.** *Weatherwise*, 7(6):164–166, Dec. **1954.** 4 figs. **MH-BH**—A play-by-play account of the 3 hurricanes (Carol, Edna and Hazel) which raked the East Coast of the United States during Aug., Sept. and Oct. 1954, follows a brief description of the anomalies of weather in Sept. and Oct. 1954 in the U. S. A., and charts showing temperature and precipitation anomalies for the 2 months. Sept. was very warm in the East and Central States. October was cold in NW, warm in SW and NE. *Subject Headings:* **1. Hurricanes, 1954 2. Weather anomalies 3. East Coast, U. S.**—*M.R.*

6.7–182 551.515.2

§Malkin, William and Holzworth, George C. (*WBAN Analysis Center, Wash., D. C., U. S. W. B.*), **Hurricane Edna, 1954.** *Monthly Weather Review*, 82(9):267–279, Sept. **1954.** 14 figs., 3 tables, 22 refs. **MH-BH**—The authors analyze some of the meteorological features

associated with the origin and movement of hurricane "Edna," the center of which reached New England on Sept. 21, 1954. A detailed account is given of the formation of Edna, its track, of the various developmental stages of the air flow at the surface and at 500 mb and of the steering aspects. *Subject Headings:* **1. Hurricane "Edna" (1954) 2. Hurricane dynamics.** —*I.L.D.*

6.7–183 551.515.2:627.52

*†Myers, Vance A., **Characteristics of United States hurricanes pertinent to levee design for Lake Okeechobee, Florida.** *U. S. Weather Bureau, Hydrometeorological Report*, No. 32, March **1954.** 106 p. 53 figs., 12 tables, 21 refs., 12 eqs. **DWB**—This report describes the development of meteorological concepts and techniques which, in combination with oceanographic techniques, can provide design values for the levees on the shores of Lake Okeechobee. The techniques for analyzing wind and pressure data in selected hurricanes, involving the determination of wind speed profiles, wind-direction spirals and speed of movement, the reconstruction of winds and that of storms prior to water-stage recorders, and the transposition of hurricanes are described. The application of these techniques and analyses to evaluating the characteristics and resultant wind fields over Lake Okeechobee is illustrated. The results of the analyses are represented graphically. *Subject Headings:* **1. Levee design 2. Hurricane analysis 3. Wind effects on lake levels 4. Lake Okeechobee, Florida.**—*I.L.D.*

6.7–184 551.515.2:551.55(759)

Schloemer, Robert W., **Analysis and synthesis of hurricane wind patterns over Lake Okeechobee, Florida.** *U. S. Weather Bureau, Hydrometeorological Report*, No. 31, March **1954.** 49 p. numerous figs., 3 tables. **DWB**—The climatological basis for synthesizing the design hurricane by analyzing the characteristics of all significant hurricanes that reached any part of the U. S. during a fifty-year period and the relationship of actual winds to theoretical winds and the frictional dissipation of hurricanes over land are investigated. This study presents a method for reconstructing the track and the pressure and wind fields of a hurricane from sparse data, estimates the central pressures of virtually all hurricanes that reached the U. S. during a fifty year period, gives a procedure for reducing gradient winds to anemometer level winds at Lake Okeechobee, estimates the frequency of occurrence of hurricane winds at the coast, indicates that free air winds in a hurricane range along a storm radius from subgradient speed at the periphery to supergradient speed at the radius of maximum wind, evaluates the average falling characteristics of hurricanes moving inland, confirms the existence of an inverse relationship between hurricane intensity and lateral extent and presents the gust factors observed in hurricanes. The appendix includes a description of the method for approximating the gradient wind speed. Also maps showing hurricane tracks for 1900–1949 and wind profiles for the hurricane of Aug. 26–27, 1929. *Subject Headings:* **1. Hurricane analysis 2. Wind profiles 3. Hurricane winds 4. Lake Okeechobee, Florida. I. U. S. Army. Corps of Engineers.**—*I.L.D.*

6.7–185 551.515.21

Jordan, C. L. (*Chic. Univ.*), **On Syōno's initial stages of typhogenesis.** *Tellus*, 6(2):189, May **1954.** 3 refs. Syōno, S., [**Reply**], *Ibid.*, p. 199, 2 refs. **MH-BH**—The author questions Syōno's picture of the formation of a tropical storm as described in his physical model in **On the formation of tropical cyclones,** *Tellus*, 5:179–195, **1953,** and the mechanism proposed for the pressure fall in the initial stage of "typhogenesis." Syōno replies that in regard to typhogenesis the objections of Jordan are the result of a difference in definitions and that his criticism of the pressure tendency equation is based upon misinformation. *Subject Headings:* **1. Cyclogenesis 2. Typhoon formation. I. Syōno, S.**—*I.L.D.*

6.7–186 551.515.3(73)

Beebe, Robert G. (*Severe Local Storms Center, U. S. W. B., Wash., D. C.*), **Types of upper air soundings preceding tornadoes.** June 21, **1954.** 4 p. 4 figs., 6 refs. Reproduced from typescript. **DWB**—Four thermodynamic types are recognized as occurring just prior to tornado occurrences. The most frequent type for tornado occurrence is type I—inversion with dry air over moist air. Type III is common preceding tornadoes in the SE states (no

inversion and moist air above moist). The other two types are more unusual (type II—moist air over dry and steep lapse rate and no inversion), type IV is West Coast type (no inversion and dry over moist). *Subject Headings:* **1. Tornado forecasting 2. Upper air soundings 3. Synoptic conditions for tornadoes 4. United States.**—*M.R.*

6.7–187 551.515.3(47)

§Remizov, G. A., **Tornado pod Moskvoĭ.** [Tornado near Moscow.] *Priroda*, Moscow, 43(8):100–102, Aug. **1954.** 4 figs. **DLC**—A rare (in this zone of moderate climate), typical case of tornado which occurred on Aug. 17, 1951 in the Khimki District of Moscow region is described and commented on. Although the path of the tornado was short and its width only from 200 to 1000 m the storm was very violent and uprooted and damaged a great number of trees. It was accompanied by heavy precipitation (48 mm) and at some places by thunder, lightning and hail (pigeon egg size). One vortex, shaped like an elephant trunk was seen to touch the earth. A detailed description of the synoptic situation (with charts) before and after the passing of the tornado gives a complete picture of the phenomenon. *Subject Headings:* **1. Tornadoes 2. Synoptic conditions for tornadoes 3. Khimki District, Moscow, U.S.S.R.**—*A.M.P.*

6.7–188 551.515.4:551.541(753)

§Holleyman, J. B. (*U. S. Weather Bureau*), **The Washington, D. C. storm of June 26, 1954.** *Monthly Weather Review*, 82(7):200–208, June **1954.** 10 figs., 2 refs. **MH-BH**—This storm was associated with the largest pressure jump ever recorded in the Middle Atlantic coastal area. Analyses of the synoptic situation and of the pressure jump line which traversed the distance from La Crosse, Wisconsin, to Virginia-Maryland, a description of the thunderstorms accompanying the pressure jump, of the temperature and precipitation data and of the upper air data are presented. *Subject Headings:* **1. Thunderstorms 2. Pressure jump 3. Washington, D. C.**—*I.L.D.*

6.7–189 551.515.8:551.553.8(931)

Renshaw, P. K., **Cold fronts in Southern New Zealand.** *Gliding*, London, 5(2):54–56, Summer **1954.** fig. **DWB**—A vivid account of a cold front squall which hit South Island, coming fresh from the Antarctic. The effects of the turbulence on the glider are described. *Subject Headings:* **1. Line squalls 2. Cold fronts 3. South Island, New Zealand.**—*M.R.*

6.7–190 551.515.8:551.555.1:551.557.2(595)

*Watts, I. E. M., **Line-squalls of Malaya.** *Malayan Journal of Tropical Geography*, Singapore, No. 3, Oct. **1954.** 14 p. 10 tables. **DLC**—A synoptic study of the sumatras and other squalls on the south-west coast of Malaya. Isochrones and upper air data are given for a number of examples. They may exceed 30 m.p.h. and advance eastward along a line which may exceed 200 miles. *Subject Headings:* **1. Line squalls 2. Malaya.**—*C.E.P.B.*

RADIATION AND TEMPERATURE

RADIATION

See also: **Radiative transfer** (Kourganoff), 6.7–12; **Solar cookers** (Ghai, others), 6.7–100; **Night radiation** (Drimmel), 6.7–112; **Insolation in Warsaw** (Liana), 6.7–115; **Coal dust** (Bensin), 6.7–152; **Created microclimate** (Bensin), 6.7–317.

6.7–191 551.521

Wegener, Kurt (*Univ. of Graz, Austria*), **Die "Strahlung" bei Pouillet und Kirchhoff** ["Radiation" according to Pouillet and Kirchhoff.] *Geofisica Pura e Applicata*, 28:285–291, **1954.** fig., table, 2 refs., eqs. German and English summaries p. 285. **MH-BH**—A theoretical paper in which the contradiction between the radiation laws of KIRCHHOFF, BOLTZMANN-STEFAN, LUMNER, KAHLBAUM and WIEN and POUILLET's definition of radiation, on the basis of which radiation measurements are still being made, is demonstrated by a model of

the black radiating body of KIRCHHOFF, constructed in 1895. Author shows also the errors in the method of determination of the solar constant and disputes the correctness of determination values presented in a list compiled by KALITIN. *Subject Headings:* **1. Radiation 2. Solar constant.**—*A.M.P.*

6.7–192 551.521.1:6

Degen, Heinz, **Die technische Nutzbarkeit der Sonnenenergie.** [Technical utilization of solar energy.] *Naturwissenschaftliche Rundschau*, 8(3):95–97, March **1955. DWB**—Comparisons illustrate the enormous solar energy reaching the earth. Methods of utilizing it are described—solar furnaces (dating back to ARCHIMEDES), house heating, water heating, solar engines (little developed) and chemicals from sea water by evaporation. *Subject Headings:* **1. Solar furnaces 2. Solar engines 3. Solar houses.**—*C.E.P.B.*

6.7–193 551.521.1

Deirmendjian, Diran and Sekera, Zdenek, **The global radiation in a Rayleigh atmosphere.** *Nature*, London, 175(4454):459–461, March 12, **1955.** 3 figs., table, 6 refs., 5 eqs. **DWB**—Radiative transfer treatment of S. CHANDRASEKHAR is applied to finding the total flux of energy received at the lower boundary of a scattering atmosphere receiving parallel radiation from a single direction. Examples are shown for different wave lengths and integrated for solar zenith distances 0, 53.1 and 84.3°, including pure sky radiation separately. *Subject Heading:* **1. Radiation calculations.**—*C.E.P.B.*

6.7–194 551.521.1(661) 551.526(661)

*Masson, H., **Contribution à l'étude de l'échauffement de l'eau sous l'effet de la radiation solaire (2e note).** [Contribution to the study of warming of water under the influence of solar radiation (2nd note).] *Dakar. Institut des Hautes Études. École Supérieure des Sciences, Annales*, v. 1, **1954.** 23 p. 7 photos, 2 figs., 2 tables, 2 refs., eqs. Abstracted from reprint. **DWB**—This is an account of experimental work carried out in order to determine the efficiency of various substances such as fuel oil, glass-skylights of varying thickness and combinations of fuel oil with glass-skylights, etc. in absorbing solar heat and conserving it to reduce nocturnal cooling in stagnant and running bodies of water. The results of experiments with sheet iron over stagnant water with fuel oil, glass over running water with fuel oil, the effect of the aging of the fuel oil and the size of the basin are analyzed and illustrated. In the appendix daily totals of global radiation for 1952 at Hann are given. (For abstract of Pt. I, *see* 4.2–131, Feb. 1953, *MAB.*) *Subject Headings:* **1. Solar radiation 2. Water temperatures 3. Nocturnal cooling 4. Global radiation.**—*I.L.D.*

6.7–195 551.521.1:660.048

Nebbia, Giorgio (*Univ. of Bari*), **Sull'utilizzazione dell'energia solare.** [The utilization of solar energy.] *Geofisica e Meteorologia*, Genoa, 2(3/4):50–54, May/Aug. **1954.** photo, 2 tables, 13 refs. **MH-BH**—A review of the program of developing stills using solar energy being carried out at the Institutes of Meteorology of the Univ. of Bologna and of the Univ. of Bari. The construction and operation of the still are described and a table showing amount of water distilled on specific days under given temperature and cloudiness conditions at Bari is presented. The various localities in Italy, Africa and the Near East where solar stills could be utilized for providing potable water are listed and the conditions for using these stills are discussed. *Subject Headings:* **1. Solar energy utilization 2. Solar distilleries.**—*I.L.D.*

6.7–196 551.521.11:551.586:616

Blum, H. F. (*Princeton Univ.*), **Effects of sunlight on man.** *Meteorological Monographs*, Boston, 2(8):43–49, Oct. **1954.** 2 figs., table, 10 refs. **MH-BH**—A review of the literature dealing with the physiological and pathological effects of sunlight and of the different parts of the solar spectrum upon man. The discussion includes: the penetration of sunlight into the skin and eye, the photochemical effects of sunlight upon the skin as expressed in the sunburn complex, antirachitic action, production of skin cancer and in other skin diseases such as urticaria solare; and the eye. Effects of solar radiant energy, the relationship between sunlight and health, and the role of sunlight, as a limiting factor on human survival, are

considered. *Subject Headings:* **1. Sunlight effects 2. Skin sensitivity 3. Skin diseases 4. Urticaria solare.**—*I.L.D.*

6.7–197 551.521.11:551.588.2:551.586:631(432)

Wagner, H. and Dinger, H.-J., **Die Besonnung im oberen Vogtland und ihre Bedeutung für Pflanzenwachstum.** [Insolation in upper Vogtland and its importance for plant growth.] *Angewandte Meteorologie*, 2(4):122–125, Jan. **1955.** fig., 4 refs. **MH-BH**—A method of charting the distribution of incoming radiation in hilly country is described and a chart of annual income in Upper Vogtland (southern parts of Saxony and Thuringia) is given. It ranges from over 130,000 to under 120,000 cal cm^{-2}. High insolation brings forward dates of crop changes, correlations varying from 0.33 to 0.49. *Subject Headings:* **1. Insolation 2. Agricultural climatology 3. Saxony, Germany 4. Thuringia, Germany.**—*C.E.P.B.*

6.7–198 551.521.12(421)

*Blackwell, M. J., **Five years continuous recording of total and diffuse solar radiation at Kew Observatory.** *Great Britain. Meteorological Research Committee, M.R.P.* 895, Dec. 30, **1954.** 19 p. 15 figs., 6 tables, 9 refs. Mimeo. **DWB**—Records of Moll-Gorczynski solarimeters for total and diffuse radiation on a horizontal surface, in 1947 through 1951 are described. Sources of error are exhaustively examined. Tables give corrected hourly means of total and diffuse radiation, computed extraterrestrial radiation on a horizontal surface, and hourly means of sunshine, all for 10-day periods. Values are shown in graphs, which also include diffuse and total radiation on cloudless days and correlation of total radiation with sunshine. *Subject Headings:* **1. Actinometric data 2. Kew Observatory, England.**—*C.E.P.B.*

6.7–199 551.521.14

Sauberer, Franz, **Zur Abschätzung der Gegenstrahlung in den Ostalpen.** [The evaluation of counter radiation in the eastern Alps.] *Wetter und Leben*, Vienna, 6(3/4):53–56, June **1954.** 4 tables, 7 refs. **MH-BH**—A formula for determining counterradiation in the eastern Alps, taking into consideration cloudiness, is proposed. This formula is: $G_w = G_0 + \sigma T^4 kw - G_0 kw$, where G_w = counterradiation during cloudiness (in tenths); G_0 = counterradiation during cloudiness 0/10; w = cloudiness in tenths of sky surface, k = parameter for cloudiness type. Tables give parameter k, annual variations and daily radiation total of counterradiation for different cloudiness amounts as a function of elevation above sea level. *Subject Headings:* **1. Counter radiation 2. Albedo of clouds 3. Eastern Alps.**—*I.L.D.*

6.7–200 551.521.3

Tsao, C. J. and Curnutte, B., **Line widths of pressure broadened spectral lines.** Ohio State Univ. Research Foundation, Contract AF 19(122)-65, Scientific Report, No. AI-8, June 28, **1954.** 68 p. 18 refs., 182+eqs. **MH-BH**—This report is mainly of a review and expository nature and has been prepared for the purpose of outlining in considerable detail the method of calculating the width of pressure-broadened spectral lines by using the impact theory of P. W. ANDERSON. In Sec. I, the general quantum mechanical result is derived. In Sec. II the adiabatic approximations are discussed. In Sec. III, ANDERSON's theory has essentially been repeated with some slight changes. In Sec. IV, several cases of molecular interactions are treated. The calculations have been extended to include the effect of the nonresonant terms of the interaction matrix which are neglected in ANDERSON's work. *Subject Heading:* **1. Pressure broadening of spectral lines.**—*Authors' abstract.*

6.7–201 551.521.63:535.34

Curtis, John P.; Rense, William A. and Todd, Barbara, **Extreme ultra-violet research.** Colorado. Univ. Engineering Experiment Station, Contract AF 19(604)-631, Scientific Report, No. 1, March 1, 1953–March 1, **1954.** 28 p. 19 figs. (incl. photos), 2 tables, eqs. **MH-BH**—The report describes work done from March 1, 1953 to March 1, 1954 on the design, construction and calibration of a rocket spectrograph for use in aerobee flight on Oct. 7, 1953 for studying the UV spectrum of the sun. Studies were also made of the UV absorption properties of atmospheric gases. Apparatus and results are described in detail, illustrated and tabulated. The rocket flight failed, but not on account of failure of the equipment prepared

under this contract. *Subject Headings:* **1. Ultraviolet spectrographs 2. Rocket instrumentation.**—*M.R.*

6.7–202 551.521.64

Dardis, J. G. and McCusker, C. B. A., **A possible variation in the rate of local penetrating showers.** *Physical Society of London, Proceedings, Ser. A*, 67(11):1026–1027, Nov. 1, **1954.** 3 refs. **DWB**—Local penetrating showers at Dublin showed a maximum of 1.64 per hr at 17–21h G.M.T. and a minimum of 1.43 at 9–13h. If real this effect is probably associated with very high energy primaries. *Subject Heading:* **1. Cosmic ray showers.**—*C.E.P.B.*

6.7–203 551.521.64:612:616

†Duell, G. and Duell, B. (*Calif. Acad. of Sciences*), **Organic responses to cosmic rays and their secondaries.** *Meteorological Monographs*, Boston, 2(8):61–67, **1954.** fig., 40 refs. **MH-BH**—The literature on the biological effects of both primary and secondary cosmic radiation is reviewed. Observational and experimental evidence on the relationship of cosmic ray intensity to cancer mortality, the biologic effect of ordinary rays on *Drosophila melanogaster*, bacteria, plants, etc., and on the carcinogenic action of cosmic rays on mice, etc. *Subject Headings:* **1. Cosmic ray effects 2. Carcinogenesis 3. Cancer mortality 4. Cosmic ray intensity.**—*I.L.D.*

6.7–204 551.521.64

Wolfendale, A. W. (*Univ. of Manchester*), **Experiments on μ-mesons at Manchester and Ceylon.** *Il Nuovo Cimento, Supplement* No. 1, to v. 12, **1954.** p. 107–110. refs. **DLC**—Discusses sea level μ-meson spectrum ionization loss in a proportional counter and experiments in Ceylon where 6880 photographs were obtained showing at least 1 track penetrating the lead plate. The Manchester Magnetic Cosmic Ray Spectrograph was modified so as to measure very high momentum particles, and the results are described. *Subject Headings:* **1. Meson spectrum 2. Manchester cosmic ray spectrograph 3. Ceylon.**—*M.R.*

TEMPERATURE

See also: **Susquehanna Ice Bridge** (Ludlum), 6.7–76; **How temp. affects electric system** (Fleischmann), 6.7–96; **Air temp. profiles,** (Portman), 6.7–106; **Atmos. winds and temp.** (Kennedy, Brogan), 6.7–345.

6.7–205 551.524:595.7

Henson, W. R.; Stark, R. W. and Wellington, W. G., **Effects of the weather of the coldest month on winter mortality of the lodgepole needle miner, *Recurvaria* sp., in Banff National Park.** *Canadian Entomologist*, 86(1):13–19, Jan. **1954.** fig., 7 tables, 2 refs. Abstracted from reprint. **MH-BH**—In the complicated topographical region around Lake Louise and Banff (Bow Valley), Alberta, the coldest winter months occur at low elevations (in valleys) when there is little frontal activity and cold pools of cP air stagnate in the valleys, at higher elevations (on slopes) on the other hand, the coldest winter months occur when circulation is stronger and air mass changes more frequent. The mortality of the lodgepole needle miner shows a direct relation to the temperature of the coldest month and so to the frequency of frontal passages, as shown by the analysis of temperature data and air mass or frontal passages over the Bow Valley in 1948–49 and 1949–50. The former winter had more frontal passages in Jan. and far less mortality in valley bottoms than did the latter winter when mortality was nearly 100% and cP air prevailed most of the month. On the slopes the reverse was true. Hence the middle zones are the most liable to be zones of reinfestation, not being subject to the extremes found on the higher slopes or in the valley bottoms. *Subject Headings:* **1. Lodgepole needle miner 2. Cold winters 3. Forest entomology 4. Temperature effects on insects 5. Banff National Park, Alberta.**—*M.R.*

6.7–206 551.524.32(711)

Rebman, Edwin J., **January temperature profile, Victoria, B. C. A west-coast singularity.** *Weather*, 9(5):131–136, May **1954.** 5 figs., 4 refs. **DWB**—Three-day running means of

daily maximum temperature at Gonzales Observatory, 1885–1953 and 1899–1939 show a period of cooling near Jan. 14 and warming near Jan. 26. Cooling is best developed in high-index months and warming in low index months; this is explained by mean surface charts 1899–1939, for Jan. 14 and 26 and air trajectories for those days superposed on a sea temperature chart. *Subject Headings:* **1. Temperature singularities 2. Victoria, B. C.**—*C.E.P.B.*

6.7–207 551.524.32:551.513

Rebman, Edwin J. (*U. S. W. B. Office, Walla Walla, Wash.*), **Singularities in weather at Walla Walla, Wash., as related to the index of zonal westerlies.** *Monthly Weather Review*, 81(12):386–387, Dec. **1953.** 2 figs., 4 refs. **DWB**—Using the E. W. Wahl technique for analyzing long period climatic records for singularities associated with zonal index types, the author took maximum temperature and precipitation frequency data for Walla Walla, Wash., for 1899–1939 and divided them into two groups: (a) low and (b) high index types. The 3-day temperature curve shows a peak of frequency of (3-day running) maximum temperatures in early and one in late Jan. especially with low index type, and one in early and in late June for (3-day running) mean daily rainfall frequency. The first June maximum is composed mainly of high index cases and the second of low index cases though the latter is not too impressive. *Subject Headings:* **1. Singularities 2. Circulation type singularities 3. Walla Walla, Wash. I. Wahl, E. W.**—*M.R.*

6.7–208 551.524.36:634.9 551.574.42:634.9

*Boggess, W. R. and McMillan, F. W., **Cold weather and glaze damage to forest plantations in Southern Illinois.** *Illinois. Univ. Agricultural Experiment Station, Bulletin*, No. 574, April **1954.** 23 p. 7 figs., 8 tables, 8 refs. **DWB**—The effect of low temperature amounting to −11° to −23°F upon loblolly and shortleaf pine showed that the former is more susceptible to cold than the latter but that, nevertheless, the occurrence of undamaged plantations of loblolly pine indicate that it can be grown successfully in Southern Illinois. The effect of glaze storms upon shortleaf and loblolly pine is also examined and it is found that under similar conditions loblolly pine is more susceptible to glaze than is shortleaf pine. *Subject Headings:* **1. Low temperature effects on pines 2. Pine forests 3. Glaze effects on pines 4. Southern Illinois.**—*I.L.D.*

6.7–209 551.524.36

§Hawkins, H. F., Jr., **The weather and circulation of July 1954. One of the hottest months on record in the central U. S.** *Monthly Weather Review*, 82(7):209–217, July **1954.** 9 figs., 4 refs. **MH-BH**—July 1954 was one of the hottest months on record in the Central United States; this month was characterized by a persistence of weather type over many regions of the Northern Hemisphere. The author describes the world wide special weather features of this month. The Northern Hemisphere circulation, circulation pattern over the United States, the temperature and precipitation, and the hottest period with its attendant synoptic situation. *Subject Headings:* **1. Extreme temperatures 2. Hot summers 3. General circulation 4. United States.**—*I.L.D.*

6.7–210 551.524.37:634

Federal-State Frost Warning Service, Lakeland, Florida, **Photographs of groves after Feb. 1947 freeze and various types of grove heaters.** [1948?] entirely photos, tipped in, legends in typescript. **DWB**—A collection of 26 excellent photographs taken near Lakeland, Florida, of orange groves, fruit, foliage, trunks, heaters, etc., with typed labels indicating situation and brief mention of conditions, which were severe (min. 17°–23°F) in some places. Growers in some places suffered 100% damage, in other situations much less. Shows difference between protected and unprotected groves, damage at different heights, and different types of heaters. Some trunk splitting occurred. *Subject Headings:* **1. Frost damage to orchards 2. Orchard heaters.**—*M.R.*

6.7–211 551.524.37:632.111

Krühne, G., **Karte der Maifrostschäden 1953 in Wernigerode/Harz.** [A map of frost damage during May, 1953, in Wernigerode/Harz.] *Zeitschrift für Meteorologie*, Berlin,

8(6):180–182, June **1954.** fig., ref. **MH-BH**—A weather situation very characteristic for May frosts provided an opportunity for mapping the frost damage to fruit orchards in Wernigerode/Harz. The synoptic situation on May 6–7 is described. Observations were made on gooseberries, currants, sweet and sour cherries, etc. A map showing the location and extent of the damage was constructed. The frost damage is greater in the valleys as a result of the cold air near the ground and is less on the slopes from which the cold air drains. *Subject Headings:* **1. Synoptic conditions for frost 2. Frost damage to orchards 3. Wernigerode/Harz, Germany.**—*I.L.D.*

6.7–212 551.524.34(4)

Schindler, Gerhard, **Kleine Analyse mitteleuropäischer Monatstemperaturen 1761–1950.** [Analysis of monthly temperatures in Central Europe 1761–1950.] *Annalen der Meteorologie*, 6(7/8):239–243, **1953/54.** fig., 14 refs. German and English summaries p. 239. **MH-BH**—Temperatures De Bilt-Berlin-Vienna are analyzed separately for each month by 25-year overlapping values. There were long periods of temperature below normal. Only Jan., March, Nov. and Dec. show significant warming during the present century. *Subject Headings:* **1. Temperature trends 2. Europe.**—*C.E.P.B.*

6.7–213 551.524.4

Sprague, V. G.; Neuberger, Hans; Orgell, W. H. and Dodd, A. V., **Air temperature distribution in the microclimatic layer.** *Agronomy Journal*, Madison, Wis., 46(3):105–108, March **1954.** 4 figs., 7 refs. **DLC**—Air temperature measurements were made at State College, Pa., between Nov. 1948 and May 1953 at various heights up to 8 feet over a Kentucky blue grass sod. The thermometer elements were copper-constantan thermocouples. The temperature climate in the air layer below a 4-foot height is more vigorous than that above this level. Temperature differences between various heights above the ground are reduced under conditions of a cloudy day and/or strong wind, and they are increased under opposite conditions. Extremes of temperature are greater at lower levels while the average daily and monthly temperatures are about the same at all levels. The microclimate is more extreme during the summer than during winter. *Subject Headings:* **1. Temperature distribution 2. Vertical temperature distribution.**—*I.L.D.*

SOIL TEMPERATURE

6.7–214 551.525.2:551.508.29

Chudnovskiĭ, A. F., **Termosetka dlia izmereniia temperatury poverkhnosti pochvy.** [A thermal net for measuring the temperature of the soil surface.] (In: Soloveĭchik, R. E., **Fizika atmosfery.** Leningrad, Gidrometizdat, **1946.** p. 76–84. 10 figs., 2 refs.) **DLC**—The methodological problems encountered in measuring the temperature of the surface of the soil are reviewed and a procedure for measuring this temperature is proposed. It is based upon the use of a resistance thermometer which does not have the defects of the bolometers commonly used and it resembles a net. The apparatus is described and illustrated with diagrams and its calibration and use are explained. *Subject Headings:* **1. Soil surface temperature measurement 2. Resistance thermometers.**—*I.L.D.*

6.7–215 551.525.4

Balls, W. Lawrence, **Seasonal soil-differences—a temperature anomaly.** *Weather*, 10(3):87–88, March **1955.** fig. **DWB**—Further observations (in 1954) of tap-water temperature near Cambridge, England, showed a combination of warm damp soil with cool damp air, causing rank vegetation. *Subject Headings:* **1. Soil temperatures 2. Cambridge, England.** —*C.E.P.B.*

6.7–216 551.525.4

Beliakov, M. F., **Geotermicheskie nabliudeniia v Krymu v XIX stoletii.** [Geothermal observations in the Crimea during the 19th century.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Izvestiia*, 86(1):100–102, Jan./Feb. **1954.** graph, table, 9 refs. **DLC**—Geothermal observa-

tions began in the Crimea in 1877 in a deep artesian bore about 70 km north of Simferopol. This is known as the Aibarsk bore and it reached a depth of 796 m. The temperature measurements are given in a table and their reliability is analyzed. *Subject Headings:* **1. Well temperatures 2. Geothermal investigations 3. Crimea.**—*I.L.D.*

6.7–217 551.525.4(43)

Zenker, H., **Singularitäten der Erdbodentemperatur in Halle/Saale.** [Singularities of soil temperature in Halle/Saale.] *Zeitschrift für Meteorologie*, 7(8):237–244, Aug. **1953.** diagrs., table, 4 refs. **MH-BH**—The 25-year record of Halle/Saale soil temperature at depths of 5 to 50 cm was examined in order to determine the reality of observed singularities. The portions of the annual curve of temperature change at 5 cm depth showing the greatest deviation from the normal were selected and the two extreme days enclosing the section of the curve are compared, taking into consideration the mean daily temperature change obtained from the course of the monthly means. The difference which forms the temperature tendency is determined for each of the 25 years and the ratio of instances favorable for the regularity to those unfavorable is expressed in percent. A good singularity is $\geqq 68\%$. Of 20 distinct singularities, 13 are examined in detail. Seven cases fail to meet the criteria of good singularity. In the upper layer only the Christmas thaw weather and the warming up in mid-January are good singularities. A comparison with the 10-year soil temperature data for Quedinburg shows great variation in singularities and supports the conclusion that these are mostly chance phenomena. *Subject Headings:* **1. Soil temperature singularities 2. Halle/Saale, Germany.**—*I.L.D.*

WATER TEMPERATURE

See also: **Water temp.** (Masson), 6.7–194.

6.7–218 551.526.8:551.311.182(798)

Williams, John R., **Observations of freeze-up and break-up of the Yukon River at Beaver, Alaska.** *Journal of Glaciology*, 2(17):488–495, April **1955.** 2 figs., 2 tables, 11 refs. English and German summaries p. 488. **DWB**—Variations of river temperature and max and min temperature are plotted in relation to freezing and break-up on river in Oct. 1949 and April–May 1950 and river levels. Weather associated with freeze and thaw is described; freeze is local, but break-up progresses downstream. Ice jams or concentrations of floating ice raised water level. *Subject Headings:* **1. River ice 2. Yukon River, Alaska.**—*C.E.P.B.*

PRESSURE AND WIND

PRESSURE

See also: **Mt. wave forecasting** (Colson), 6.7–142; **Isotropic turbulence** (Ogura, Miyakoda), 6.7–165; **Atmos. oscillations** (Donn, others), 6.7–176; **Storm** (Holleyman), 6.7–188; **Lee waves** (Khrgian), 6.7–245; **Lee waves** (Wurtele), 6.7–246.

6.7–219 551.541

Schüepp, W., **Zur Analyse von Luftdruckvariogrammen.** [On the analysis of pressure variograms.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 8(1/2):1–24, **1955.** 13 figs., 6 tables, 30 refs. German, English and French summaries p. 1–2. **DWB**—Schmidt's gas variograms showing pressure waves of 1–60 min are discussed with examples at Davos, Zurich and Glarus in 1934. By wave analysis 24 types of variogram are defined and related to four weather groups: undisturbed, föhn, cold winds, and cold fronts. Numerical analysis of 560 days shows that for waves of over 3 minutes the rule: frequency×amplitude =constant is nearly exact. There is some correlation between oscillations at the 3 stations, and between amplitude of oscillations and wind velocity on Säntis. In föhn situations short period waves predominate, in moving cold air waves of long period. *Subject Headings:* **1. Microbarometric oscillations 2. Switzerland.**—*C.E.P.B.*

6.7–220 551.543

Haurwitz, B., **Atmospheric oscillations.** New York Univ. College of Engineering Research Div., Contract AF 19(122)-49, Final Report, April **1954.** 89 p. 6 tables, bibliog. p. 85–89. **MH-BH**—Four types of investigation were conducted during the period of this report, and the results systematically summarized: 1) effects on external periodic influences on the atmosphere (annual, semidiurnal, solar and lunar tidal influences), 2) flow patterns as affected by zonal wind fields (normal to 90 km, effect on planetary waves and development of tropical cyclones), 3) statistical studies of relation between tropospheric pressures, geomagnetism and solar flares, and 4) small scale disturbances such as squall lines and convection over the ocean. *Subject Headings:* **1. Atmospheric tides 2. Semidiurnal atmospheric tides.**—*M.R.*

6.7–221 551.547.1:551.510.5

Godart, O. (*Dir., Service Météorologique d'Aviation, of Belgium*), **Emploi de la hauteur barométrique comme coordonné verticale.** [Use of the barometric height as the vertical coordinate.] *Belgium. Service Météorologique d'Aviation. Régie des Voies Aériennes, Bulletin Trimestriel*, p. I–XIII, June/Aug. **1953.** map, graphs, 3 refs., 48 eqs. **DWB, MH-BH**—The standard atmosphere for the troposphere is used as a polytropic gas of reference for the real atmosphere. The vertical coordinate is then the barometric height, used for the calibration of altimeters and for the scale of the vertical cross-sections. The general equations of the meteorological problem contain only linear explicit functions of the vertical coordinate. In addition to an integral of potential temperature, there is another similar to the one of potential series of the vertical coordinate, rapidly convergent for practical purposes. Moreover, this treatment is very suitable for computation of deviations from the standard atmosphere. Two models with nonconvergent levels are proposed. *Subject Headings:* **1. Standard atmosphere 2. Equivalent height.**—*Author's abstract.*

TURBULENCE

See also: **Turbulent heat transfer** (Marris), 6.7–164; **Isotropic turbulence** (Ogura, Miyakoda), 6.7–165; **Turbulent diffusion** (Ogura, Miyakoda), 6.7–166; **Typhoon waves** (Gherzi), 6.7–180; **Hurricane wind pattern** (Schloemer), 6.7–184.

6.7–222 551.551

Clear air turbulence and its allied phenomena. *Shell Aviation News*, London, No. 192:14–15, June **1954.** 3 maps. **DLC**—An account of clear air turbulence encountered on 300 flights of test Canberras and experimental jet bombers at altitudes above 18,000 feet over western Europe. Although based on unstandardized observations, this summary includes much useful information regarding the distribution of five intensities of turbulence, according to height, as well as estimates of the vertical extent of turbulence bands. Layers of thick haze not visible from the ground—a phenomenon not yet fully explained by meteorologists—were encountered to heights of 46,000 feet. 300 mb maps for selected days of severe clear air turbulence are shown. *Subject Headings:* **1. Clear air turbulence 2. Haze.**—*R. Quiroz.*

6.7–223 551.551:551.557

Jones, D. C. E., **Exceptionally severe clear-air turbulence and other phenomena on April 14, 1954.** *Meteorological Magazine*, London, 84(994):107–111, April **1955.** 3 figs., 4 refs. **DWB**—Very severe turbulence was experienced at 40,000 ft near Edinburgh, sufficient to turn the aircraft upside down. Upper air data show that the aircraft was in the upper troposphere in a region of pronounced wind shear near the jet stream before the turbulence standing waves were experienced. *Subject Heading:* **1. Clear air turbulence.**—*C.E.P.B.*

6.7–224 551.551

Report of abnormally heavy turbulence along Calcutta-Karachi route on June 4, 1953. *Indian Journal of Meteorology and Geophysics*, 5(2):188, April **1954. MH-BH**—Extracts from a report of heavy turbulence experienced during a flight, radiosonde data for Jodhpur for 3 and 4 June 1953, and a description of the accompanying weather conditions are given. *Subject Headings:* **1. Atmospheric turbulence 2. Calcutta-Karachi air route 3. India.**—*I.L.D.*

6.7–225 551.551:551.558.29

*Van der Hoven, Isaac and Panofsky, H. A., **Statistical properties of the vertical flux and kinetic energy at 100 meters.** Pennsylvania State University. Mineral Industries Experiment Station, Dept. of Meteorology, Contract AF 19(604)-166, Final Report, June 30, **1954.** 55 p. 54 figs., 9 tables, 15 refs., 20 eqs. Mimeo. **MH-BH**—Using the 125 m meteorological tower of the Brookhaven National Laboratory the authors made wind, temperature and radiation measurements at the 23 m, 46 m and 91 m levels in order to determine the special distribution of turbulent energy and stress at these levels and the relations between energy and stress with mean wind speed, radiation lapse rate and height. The instrumentation, the method of crude spectral analysis and of exact analysis as recommended by TUKEY are described in detail. The conclusions are as follows: "The importance of low frequencies and spectra and cross spectra of all kinds increase with increasing height and with decreasing stability. Spectral intensities are generally linear functions of the square of the wind speed. The ratio of cross spectrum to spectrum of vertical velocity at any frequency is well determined by the ratio of vertical wind shear and frequency. At least under stable conditions at 91 m, and under all conditions at lower levels a gap in horizontal speed spectra is indicated at frequencies less than 20 cycles/hour. Quadrature spectra made possible an estimate of the vertical extent of the predominant eddies. The stress and energy of turbulence near 100 m, both vertical and three dimensional, can be estimated from the wind speed at a given level and shortwave radiation intensity. Eddy viscosities at 100 m depend strongly on stability of the air. Stress and energy decrease with increasing height when the stratification is near-vertical." *Subject Headings:* **1. Vertical eddy flux 2. Turbulent energy 3. Kinetic energy 4. Turbulence.**—*I.L.D.*

WIND

See also: **Cold fronts** (Renshaw), 6.7–189; **Line squalls** (Watts), 6.7–190; **N.E. monsoon,** 6.7–274.

6.7–226 551.552(43)

*Böer, Wolfgang (*Hq. for Climatology, Potsdam, Germany*), **Windverteilung für die Station Leipzig im Zeitraum 1925–1944.** [Wind distribution for Leipzig station during the period 1925–1944.] *Zeitschrift für Meteorologie*, 8(7/8):209–211, July/Aug. **1954.** 2 figs., table, ref. **MH-BH**—This article contains a table giving the frequency in percent of all observations of individual wind direction (16 point wind rose) according to intensity groups for month and year (average for period 1925–1944) for Leipzig and diagrams showing the corresponding values for the year and the summer and winter seasons. *Subject Headings:* **1. Wind distribution 2. Wind intensity 3. Leipzig, Germany.**—*I.L.D.*

6.7–227 551.553

Turner, H. S. and Lamb, H. H., **Unusual behaviour of the wind at Luqa Airport, Malta.** *Meteorological Magazine*, London, 84(993):92–93, March **1955. DWB**—Referring to article by H. H. LAMB (Met. Mag., 83(987):264–268, Sept. 1954; *see* 6.2–208, Feb. 1955, *MAB*), TURNER attributes the wind oscillations to lee waves from the cliffs. LAMB rejects this suggestion. *Subject Headings:* **1. Wind variations 2. Malta.**—*C.E.P.B.*

6.7–228 551.553.11(74)

Rexboard, F. Howard (*U. S. Weather Bureau, Boston*), **Boston's east wind.** *Weatherwise*, 7(3):60–63, 67, June **1954.** tables, figs. **MH-BH**—The sea breeze which is famous at Boston may occur suddenly (if delayed until the middle of the day) or gradually, starting in the early or mid-morning. In the former case the temperature stays low—in the latter it may equal that inland before the sudden drop occurs. Spring, when the water temperature is cooler than land, is the most favorable season for the sea breeze. Meteorological conditions attending the sea breeze, both surface and aloft (wind, temperature, humidity, vapor pressure), are shown graphically and other conditions (fog, pressure gradients, visibility) described. The sea breeze has been known to penetrate 22 to 25 miles inland along Mass.-New Hampshire Coast. The wind veers during course of day so at end of day it blows parallel to coast. Data on onset gradient winds, duration, maximum speed, etc., are tabulated for Boston Airport. Similarity

of sudden sea breeze onset to frontal passage is brought out. *Subject Headings:* **1. Sea breezes 2. Boston, Mass.**—*M.R.*

6.7–229 551.553.8:551.556.1:634.9(411)

†Anderson, K. F., **Gales and gale damage to forests, with special reference to the effects of the storm of 31st January 1953, in the north-east of Scotland.** *Forestry*, Oxford, 27(2): 97–121, **1954.** 2 figs., table, 57 refs. **DLC**—The storm of 31 Jan. 1953 did unprecedented damage. Average and extreme winds and other climatic factors, physiography and soil conditions and their effect on wind damage in Scotland are discussed. No species of tree was entirely wind-firm; larch, oak and sycamore proved most resistant and spruce was not more damaged than Scots pine. Very few trees below 30 ft high were thrown and there was a rapid increase of damage at 45 ft. The effect of lay-out of forests is discussed. The greatest danger arises when a funnel effect develops through a break in the canopy. Hence stands of not over 10 acres are an advantage. Much literature is reviewed. *Subject Headings:* **1. Gales 2. Wind damage 3. Forests 4. Scotland.**—*C.E.P.B.*

6.7–230 551.553.8(54)

*Ramakrishnan, K. P. (*Met. Office, Poona*), **The stronger squalls of Poona.** *Indian Journal of Meteorology and Geophysics*, 4(3):243–248, July **1953.** 7 figs., 6 tables, 4 refs. **MH-BH**—Statistical analysis of major squalls (maximum gust speeds of 40 mph or more) recorded at Poona Met. Office during the period 1930–1949. The tables presented give number of days with squalls for each month of the 20-year period, and seasonal distribution according to hour of commencement, duration, maximum gust speed, and direction. Anemograms of selected representative squalls are presented. *Subject Headings:* **1. Squall frequencies 2. Poona, India.**—*G.T.*

6.7–231 551.555.8:551.515.8(47)

Evseev, P. K., **O prirode letnikh sukhoveev na iugo-vostoke evropeĭskoĭ territorii SSSR.** [The nature of summer dry winds in the southeast of European U.S.S.R.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofizicheskaia*, No. 2:123–133, **1954.** 2 figs., 6 tables, 18 refs. **DLC**—The origin of the air masses causing dry winds is investigated on the basis of an analysis of the synoptic processes of 21 summer dry winds during the interval 1938–1941. It is shown that the dry winds of southern and southeastern European Russia are not found in air masses arriving from Central Asia but in transformed air masses reaching European Russia from the west, north and northeast. The high wind velocities associated with dry winds are analyzed. *Subject Headings:* **1. Dry winds 2. Air mass analysis 3. Air mass transformation 4. Eastern U.S.S.R.**—*I.L.D.*

6.7–232 551.555.8(47)

Ryzhikov, D. P., **Bor'ba s pyl'nymi buriami.** [Struggle with dust storms.] *Priroda*, Moscow, 5:99–101, May **1954.** 3 figs. **DLC**—Dust storms occur fairly often in the steppe region of the southern Ukraine—about once every two years since 1928. They are most frequent in the early spring. The wind velocities characterizing these dust storms, the soil moisture conditions, the precipitation and their effect upon the soil and crops are discussed. *Subject Headings:* **1. Dust storms 2. Southern Ukraine, U.S.S.R.**—*I.L.D.*

WIND EFFECTS

See also: **Moving sands** (Petrov), 6.7–15; **Gale damage to forests** (Anderson), 6.7–229.

6.7–233 551.556:624.21

Biggs, John M.; Mamyet, Saul and Adachi, Jiro *(all from M.I.T.)*, **Wind loads on girder bridges.** *American Society of Civil Engineers, New York, Proceedings*, v. 81, Separate No. 587, Jan. **1955.** 24 p. 15 figs., 4 tables, 6 refs. **DWB**—Wind load coefficients at various angles of attack were determined in M.I.T. wind tunnel tests and are presented in graphs for various models of railway and highway bridges. It is found that vertical forces and overturning moments are not significant for open-deck railway bridges but may be a significant

design consideration on solid-deck highway bridges. *Subject Headings:* **1. Bridge construction 2. Wind resistance of bridges 3. Wind loads.**—*G.T.*

6.7–234 551.556:612

Hayes, J. R. M. and Cudworth, A. L., **A windscreen for the ear.** *Acoustical Society of America, Journal*, 26(2):254–255, March **1954.** 2 figs., table. **DWB**—Faint sounds are masked by turbulence in the ear during windy weather. Tests were made and data presented to show the effect of a windscreen (made of wire mesh in the form of circular cups which fit over the ear like "Cootie Coops") on theshold of audibility during wind speeds of 10, 20, 30 and 40 mph, and for different angles at which the wind strikes the subject (10°–90°). It was found that the screens reduced masking due to wind by as much as 20 decibels when facing the wind, and they kept the listeners ears warm also. *Subject Headings:* **1. Wind effects on hearing 2. Windscreens for ears.**—*M.R.*

6.7–235 551.556:595.79

Heran, Herbert, **Versuche Über die Windkompensation der Bienen.** [Investigations of wind compensation of bees.] *Naturwissenschaften*, 42(5):132–133, March, **1955.** fig., table, 5 refs. **DWB**—Experiments with bees are described, showing that they attempt to regulate their flight speed relative to air to maintain constant speed in the desired direction over the ground. *Subject Headings:* **1. Wind effects 2. Bees.**—*C.E.P.B.*

6.7–236 551.556:551.465

Hidaka, Koji (*Tokyo Univ.*), **Drift currents in an enclosed ocean,** Pt. 3. *Oceanographical Society of Japan, Tokyo, Journal*, 8(2):51 66, Dec. **1952.** 5 figs., 6 refs., 49 eqs. **DWB**—Equation of mean transport on a rotating globe is studied, applying the theory to the entire Pacific Ocean. Numerical solutions are given for a zonal and an anticyclonic wind system, assuming the coefficient of lateral mixing as $2\times10^7 \cos^{-1} \phi$/cgs/. The mass transport of the Kuroshio determined from observations as 65×10^{12} gs^{-1}, lies between 80×10^{12} gs^{-1} for the zonal and 44×10^{12} gs^{-1} for the anticyclonic solution. Graphs show the meridional distribution of wind stress and the circulation system with a westward intensification of the currents. *Subject Headings:* **1. Ocean currents 2. Drift currents 3. Kuroshio 4. Pacific Ocean.**—*A.A.*

6.7–237 551.556:532.59

Shuleĭkin, V. V., **Povedenie zybi pri vstrechnom vetre.** [The behavior of swell during head wind.] *Akademiia Nauk SSSR, Doklady*, 97(4):655 657, Aug. 1, **1954.** fig., 3 refs., 10 eqs. **DLC**—The author examines the law of diminution of the height of waves and how the lengths of waves behave under such circumstances. This mathematical treatment is based upon earlier work of the author on the internal mechanism of wind energy supply to waves, the law of increase in length of waves as a result of wind action and on the origin of stable swells. *Subject Headings:* **1. Wind waves 2. Ocean swell 3. Ocean wave generation.**—*I.L.D.*

6.7–238 551.556:624.21

Steinman, David B., **Bridges.** *Scientific American*, 191(5):61–71, Nov. **1954.** figs., illus. **DLC**—This account of the development of various types of bridges contains a non-technical discussion of the aerodynamic action of wind upon bridges. *Subject Headings.* **1. Bridge construction 2. Wind resistance of bridges.**—*I.L.D.*

6.7–239 551.556.1:627.52

Tomczak, Gerhard, **Sturmfluten.** [Storm tides.] *Umschau*, 55(6):180–183, March 15, **1955.** 8 figs., 2 tables, 7 refs. **DLC**—The paper, illustrated by photographs of storm damage, discusses the effect of winds and pressure variations on water level and on seiches in enclosed basins. The frequency, extreme heights and annual variations of inundations on German coasts are tabulated, showing peak frequency in April, Oct. and Dec. The German storm flood warning service is mentioned. *Subject Headings:* **1. Storm surges 2. Inundations 3. Germany.**—*C.E.P.B.*

UPPER AIR WINDS

See also: **Jet stream analysis** (McClellan), 6.7–171; **Jet stream properties** (Serebreny, others), 6.7–172; **Jet stream features** (Serebreny, Wiegman), 6.7–173; **Jet stream cyclones** (Vederman), 6.7–174; **Line-squalls** (Watts), 6.7–190; **Clear air turbulence** (Jones), 6.7–223; **Atmos. winds and temp.** (Kennedy, Brogan), 6.7–345.

6.7–240 551.557:551.576.1:629.13

Cloud forms of the jet stream. *Shell Aviation News*, London, No. 180:4–6, June **1953. DLC**—By using knowledge of the jet stream gained during tests flights over the Tokyo–Honolulu air route, Pan American Airways has been able to make 3 non-stop flights a week from Tokyo to Honolulu, involving 11 hours instead of 18 hours which was required when a full stop was made at Wake. These jet stream winds averaging 70 to 80 mph are found at the 23,000 foot level used by the Boeing Stratocruisers on this route during Nov. 15 to April 15. Four types of peculiar cloud systems which help to identify jet stream areas are described and illustrated. These formations are characterized by high velocity, coherency (from horizon to horizon) and sometimes by surface gustiness. *Subject Headings:* **1. Jet stream flying 2. Jet stream clouds 3. Tokyo–Honolulu air route.**—*M.R.*

6.7–241 551.557

§Colón, José A. (*Univ. of Chicago*), **Case study of the high tropospheric wind field.** Chicago. Univ. Dept. of Meteorology, Contract N6ori-02036, Project NR 085 003, Report on Research (unnumbered), June **1954.** 10 p. numerous figs., table, 5 refs. **DWB**—In this report the author describes the period March 29–April 2, 1953 when a "high level trough traversed the whole Caribbean from west to east greatly influencing the cloud and weather structure of the troposphere." The study is based upon streamlines at 3000 ft obtained from upper air stations and ships' surface winds, and upon constant pressure charts at 1000, 500 and 200 mb. The upper air charts were constructed with the aid of thickness analysis and the 1000 mb was derived by converting sea level pressure from the surface chart. An analysis is presented of the daily synoptic history, the upper trough and vertical motion, and of the upper wind field. Synoptic charts, streamline charts, constant pressure charts, cross-sections of wind speed, etc. are presented. *Subject Headings:* **1. Upper air wind analysis 2. Streamlines 3. Synoptic analysis.**—*I.L.D.*

6.7–242 551.557:551.515.8

Eriksson, T. O. (*H.Q. Military Wea. Service, RSAF*), **A measurement of the wind aloft during a cold front passage.** *Tellus*, 6(1):27–31, Feb. **1954.** 6 figs. **MH-BH**—Winds aloft were measured every 20 minutes by means of 2 independent radar sets and checked for accuracy by triple theodolite observation, at Ytterskär and Gåsvik on the island of Väddön in the Stockholm Archipelago, on July 15, 1953. Time cross sections up to 5 km show microstructure of direction and speed of wind from 0900 to 1700 h at each station during cold-front passage. The frontal surface is clearly indicated by the crowding of the isopleths which coincides with reports and radar soundings of temperature, etc., at other stations. The results are considered accurate to <0.5 m/sec. and $<\pm 5°$ in direction and 2% in altitude. *Subject Headings:* **1. Winds aloft 2. Upper air wind microstructure 3. Triple theodolite wind observations 4. Radar wind observations 5. Cold fronts 6. Väddön Island, Sweden.**—*M.R.*

6.7–243 551.557(97)

*Korschover, Julius, **Mean winds over the Marshall Islands, Nov. 1952.** Calif. Univ. Institute of Geophysics. Oahu Research Center, Contract AF(604)-546, Scientific Report, No. 6, Oct. **1954.** 24 p. 50 figs., 21 tables, 4 refs. **MH-BH**—The report summarizes, chiefly in diagrammatic form, the mean atmospheric motion over the Marshall Islands, during the month of Nov. 1952 and the combined months of Oct. and Nov. 1952. Charts, depicting the mean field of motion at numerous horizontal levels from 2000 feet to 80,000 feet, are included. Two series of vertical cross-sections are presented, one approximately along the 167°E meridian from the equator to 20°N and the other along 7°N latitude from Truk (150°E) to Majuro (175°E). These show the variation with height of the mean zonal and meridional components of the wind, the mean wind speed, the resultant wind speed and the steadiness of

the wind. *Subject Headings:* **1. Air flow over islands 2. Wind profiles 3. Cross sections 4. Wind data 5. Marshall Islands.**—*Author's abstract.*

VERTICAL MOTION

See also: **Vertical flux and kinetic energy** (Van der Hoven, Panofsky), 6.7–225; **Lee wave clouds** (Larssen), 6.7–261; **Wave cloud** (Loewe, Radok), 6.7–262.

6.7–244 551.558.21:551.43

Corby, G. A., **Airflow over mountains.** *Nature*, London, 175(4453):414–415, March 5, **1955.** fig. **DWB**—Summary of discussion at Royal Meteorological Society Jan. 19, 1955. G. A. CORBY described occurrence of vertical currents, theory, and glider investigations of J. FÖRCHGOTT, also referred to by A. YATES. C. E. WALLINGTON and G. MANLEY discussed wave phenomena, H. H. ROSENBROEK increase of wind power on crests, K. W. V. TOWNSEND tree damage by gales in hilly country and J. S. SAWYER orographic rainfall. Turbulence associated with mountain waves was also discussed. *Subject Headings:* **1. Lee waves 2. Orographic effects.**—*C.E.P.B.*

6.7–245 551.558.21:551.541

Khrgian, A. Kh., **Podvetrennye volny.** [Lee waves.] *Priroda*, Moscow, 43(8):88–92, Aug. **1954.** 6 figs. **DLC**—A discussion of lee waves sometimes extending to great heights in the lee of mountains obstructing the free flow of winds, their origin and development manifested in lenticular clouds is presented. Although often called "inversion" the waves expand better in width and length in more stable atmosphere and the presence of inversion is not necessary. Heights of extension of these waves taken from international data are discussed at length and illustrated. DOROSITSIN's theory of the waves in an atmosphere of different degree of stability, which was later confirmed by observations, is briefly mentioned. *Subject Heading:* **1. Lee waves.**—*A.M.P.*

6.7–246 551.558.21:551.541

Wurtele, M. G., **On lee waves in the interface separating two barotropic layers.** California. Univ. at L. A. Dept. of Meteorology, Contract AF 19(122)-263, Sierra Wave Project, Scientific Report, No. 2, June **1953.** 32 p. 5 figs., 7 refs., eqs. **DWB**—Solutions are attempted for several cases of combinations of free waves and forced (lee) waves, as extensions of the theory originally developed by Lord RAYLEIGH (1883) and Lord KELVIN (1886) The asymptotic wave of HÖILAND (1951) in the 5th report of the Sierra Wave Project is given considerable attention. A simpler method for deriving the asymptotic values of the motion is introduced in the present report (which treats of surface waves and simple Rayleigh waves). *Subject Headings:* **1. Lee wave theory 2. Rayleigh waves.**—*M.R.*

AQUEOUS VAPOR, HYDROMETEORS AND HYDROMETEOROLOGY

EVAPORATION

See also: **Annual report,** 6.7–13; **Drainage basin evaporation** (Siren), 6.7–291; **Precip., evap. and runoff,** 6.7–292; **Runoff from glaciers** (Il'in), 6.7–294.

6.7–247 551.573

Ivanov, N. N., **Ob opredelnii velichiny ispariaemosti.** [The determination of the rate of evaporation.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Izvestiia*, 86(2):189–196, March/April **1954.** 4 tables, 9 refs. **DLC**—The author criticizes severely M. I. BUDYKO's method for determining evaporation through radiation balance as suggested in his book "Izmenenie klimata v sviazi s planom preobrazovaniia prirody" (*see* 4.5–1, May 1953, *MAB*). BUDYKO is accused of assuming that evaporation for individual areas is proportional to the radiation balance; this error is attributed to a confusion between evaporation from the surface of the earth and potential evaporation from a water surface. The lack of agreement between the

calculations of BUDYKO and those of other investigators is pointed out. *Subject Headings:* **1. Evaporation calculations. I. Budyko, M. I.**—*I.L.D.*

6.7–248 551.573:665

Mansfield, W. W., **Influence of monolayers on the natural rate of evaporation of water.** *Nature*, London, 175(4449):247–249, Feb. 5, **1955.** 8 refs. **DWB**—A study of the effect of oil films in reducing evaporation. Rigid films are quickly damaged by wind and dust. Performance of different films is examined, including experiments with standard evaporimeters. *Subject Headings:* **1. Moisture loss 2. Oil films.**—*C.E.P.B.*

6.7–249 551.573:551.577.33:551.579

Penman, H. L., **Components in the water balance of a catchment area.** *Royal Meteorological Society, Quarterly Journal*, 81(348):280–284, April **1955.** fig., 2 refs. **DWB**—The annual cycle of ground water, soil moisture, rainfall and runoff is described, with figures for the Thames 1931–1936. Rainfall and runoff are known accurately; the chief difficulties are the estimation of storage and the behavior of plants and soils. *Subject Heading:* **1. Hydrologic cycle.**—*C.E.P.B.*

6.7–250 551.573:551.481

Walker, H. O., **Preliminary report on estimated losses by evaporation from the surface of Lake Volta.** Accra, Gold Coast Meteorological Service, Nov. **1954.** 11 p. table, Mimeo. **GB-MO**—A preliminary examination was made of theoretical methods of estimating evaporation (energy budget and mass transfer) and practical approaches. Computed evaporation over the proposed lake is: PENMAN's method 69 inches a year, KHOSLA, 62, MEYER, 64. Experiments and evaporimeters and collection of basic meteorological data is proceeding. *Subject Headings:* **1. Evaporation 2. Lake Volta, Gold Coast.**—*C.E.P.B.*

CONDENSATION

See also: **Cold weather** (Boggers, McMillan), 6.7–208; *see also* special bibliography on **Radar Cloud Physics Studies,** p. 997.

6.7–251 551.574.1

Griggs, D. T. and Coles, N. Y., **Creep of single crystals of ice.** *U. S. Snow, Ice and Permafrost Research Establishment, Sipre Report*, No. 11, Dec. **1954.** 24 p. 31 figs., 2 tables, 7 refs. California. Univ. at L. A. Institute of Geophysics, Contract DA-21-018-ENG-220, Project DA 8-66-02-004, Final Report, Dec. **1954. DLC, MH-BH**—A commercial deep-freeze unit was modified to serve as a laboratory for growing single crystals, cutting specimens of a given orientation, testing these specimens in compressive creep, and studying thin-sections of the results on a universal stage. A method of growing single crystals of adequate size was developed by adapting the Bridgman method. Forty-one creep tests were made at temperatures ranging from −1° to −18°C. These gave an unexpected form of creep-curve in which the rate of strain continuously increases with time. The mechanism of deformation is dominantly basal translation—consistent with earlier work. The dependence on temperature and stress is expressed empirically. *Subject Headings:* **1. Ice crystal growth 2. Deep freeze experiments.**—*Authors' abstract.*

6.7–252 551.574.1:551.575.1(798)

Robinson, Elmer, **Investigation of the ice fog phenomena in the Alaska area.** Stanford Research Institute, Contract AF19(122)-634, SRI project CU-473, Report No. 15, Final Report, Feb. 1, 1953–Feb. 28, 1954, pub. May 26, **1954.** 65 p. 28 figs. (incl. photos.), 5 tables, 10 refs. **MH-BH**—The results of the 1952–1953 winter field program at Eielson Air Force Base, Alaska, are presented. This report includes an account of the history of the ice fog project, a general description and subjective impression of ice fog, the results of photomicrographic examination of ice fog particles, the effect of smoke and non-volatile substances upon visibility at Eielson AFB, studies on fog humidity by means of the Karl Fischer method on filtered and unfiltered air at ground level, temperature profile studies, atmospheric potential

measurements, electronic dew-point indicator observations, preliminary field experiments on the rise of the angular dependence of scattered light in fogs, and various micrometeorological observations. Also the instrument development and part of the 1953–54 program are described. Photographs and diagrams of the instrumentation are included. *Subject Headings:* **1. Ice fog 2. Fog studies 3. Fog instrumentation 4. Eielson Air Force Base, Alaska.**—*I.L.D.*

6.7–253 551.574.1:551.588.6

Zenker, H., **Waldeinfluss auf Kondensationskerne und Lufthygiene.** [Forest influence on condensation nuclei and atmospheric hygiene.] *Zeitschrift für Meteorologie*, 8(5):150–159, May **1954.** 9 figs., table, 5 refs. **MH-BH**—The author investigated the influence of non-foliated high forest, of pine forest and of a wooded area upon the condensation nuclei content of the atmosphere. The nuclei count 50 meters in front of the forest and at the forest edge diminishes by 27 to 45% and continues to diminish from the forest edge to 50 meters within the forest by 20 to 39%. The decline in nuclei count varies with the type of forest. *Subject Headings:* **1. Condensation nuclei 2. Forest influences.**—*I.L.D.*

6.7–254 551.574.2:629.13

Jones, R. F., **Condensation phenomena at the Exhibition of the Society of British Aircraft Constructors at Farnborough.** *Meteorological Magazine*, London, 84(993):93–94, March **1955.** photo. **DWB**—During low-level runs by high-speed aircraft, condensation was observed as a bluish-white spray over the whole upper surface, travelling with the aircraft. It is attributed to decrease of pressure over the wing surface in a detached layer of air moving very slowly relative to the wing. *Subject Heading:* **1. Condensation on aircraft.**—*C.E.P.B.*

6.7–255 551.574.41

*Shaw, R. H., **Comparison of dew duration of Duvdevani dew gauges and several crop covers.** Iowa State College. Dept. of Agronomy. Contract AF 19(604)-289, Scientific Report, No. 1, Sept. 15, **1954.** 40 p. 22 figs. (incl. photo), 10 refs. **MH-BH**—Hourly observations of dew deposition were recorded on crop covers and Duvdevani dew gauges placed at different heights in or over grass, oats, soybeans, corn and bare ground. The correlations found between duration of dew on a dew gauge located at the plant surface and the plant surface were 0.93 for grass, 0.82 for oats, 0.98 for soybeans and 0.93 for corn. The closest relationships found for dew duration were when the gauge and plant surface were at the same height. Other heights did not show as close a relationship. Various comparisons of dew duration on dew gauges located at different heights in the different covers are presented. Duration was also compared on the different crop covers. *Subject Headings:* **1. Dew duration 2. Duvdevani dew gage 3. Dew data 4. Cover influences.**—*Author's abstract.*

6.7–256 551.574.42

Ashmore, S. E., **Glazed frost at Bwlchgwyn.** *Meteorological Magazine*, London, 84(994): 122–123, April **1955. DWB**—With the approach of a warm front on Jan. 15, 1955, snow turned to freezing rain ("glazed frost"). Afterwards temperature rose still further and ordinary rain fell. *Subject Heading:* **1. Glaze.**—*C.E.P.B.*

6.7–257 551.574.42

Bigg, W. H., **Hoar frost or frozen dew?** *Weather*, 10(3):98–99, March **1955. DWB**—White frosts consisting entirely of frozen globules are rare, those consisting entirely of ice needles are frequent. *Subject Heading:* **1. Hoar frost.**—*C.E.P.B.*

FOG

See also: **Ice fog phenomena** (Robinson), 6.7–252.

6.7–258 551.575(45)

Gazzola, Adriano, **Nebbie sull'aeroport di Lignate.** [Fogs over the Linate airport.] *Rivista di Meteorologia Aeronautica*, 14(1):21–41, Jan./March **1954.** 10 figs., 3 tables, 2 refs. Italian, French, English, and German summaries p. 21. **DWB**—On the basis of meteorological conditions in Milan, fogs are classified into four types: viz. low and high altitude fogs, advection

fogs and visibility reduced by snow. In addition four weather types are distinguished and their relationships to fog types are investigated. The general characteristics of fogs at the Linate airfield are examined and the annual and hourly variation of visibility, the relationship of visibility to direction and intensity of surface winds, to type of precipitation, etc., are analyzed. *Subject Headings:* **1. Fog 2. Visibility variations 3. Linate Airport, Milan, Italy.** —*I.L.D.*

6.7–259 551.575:551.594.13

Nagamine, Motomu, **On the atmospheric electric investigation of the sea fog.** *Kakioka, Japan. Magnetic Observatory. Memoirs*, 7(1):75–78, May **1954.** In Japanese; English summary p. 75. 2 figs., eqs. **DWB**—The writer has investigated the sea fog at Akkeshi, Hokkaido. When sea fogs come over to the land, variations of the potential gradient and the conductivity of the atmosphere are observed. As the sea fogs approach the observational point, the potential gradients increase and the values of the conductivity decrease. In exceedingly dense sea fogs, the visibility is 30–40 meters and the potential gradients show high values (500–600 V/m) which are, however, confined to only three times as large as the normal value. The values of the electric conductivity are less than the normal values (0.18×10^{-4} e.s.u.). *Subject Headings:* **1. Sea fog 2. Electrical conductivity of air 3. Potential gradient.** —*Author's abstract.*

CLOUDS

See also: **Cloud forms of jet stream,** 6.7–240; **Lee wave clouds** (Karsson), 6.7–261; *see also* special bibliography on **Radar Cloud Physics Studies,** p. 997.

6.7–260 551.576.1:779

Fenton, Carroll Lane and Fenton, Mildred Adams, **Clouds in the sky.** *Nature Magazine*, Wash., D. C., 47(8):416–422, Oct. **1954.** photos. **DLC**—Thirteen beautiful half-page photographs of the normal and unusual cloud types illustrate fair weather, thunderstorm, banner, foehn, lenticular, mammatus, ice, and orographic clouds under differing lighting conditions. All were taken in the western mountains of the U.S.A. Brief notes accompany each photo. *Subject Headings:* **1. Cloud photographs 2. Western United States.**—*M.R.*

6.7–261 551.576.1:551.558.21

Larsson, Lennart (*Weather Service of the Swedish Air Force*), **Observations of lee wave clouds in the Jämtland Mountains.** *Tellus*, 6(2):124–138, May **1954.** 9 figs., 8 photos, table, 4 refs., eq. **MH-BH**—An account is presented of three years of observations of lee-wave clouds in the Jämtland Mountains, Sweden, with detailed descriptions of some individual cases. Wind and stability conditions in connection with the occurrence of the clouds are given. A brief discussion of the agreement between observed conditions and theoretical results is attempted. *Subject Headings:* **1. Lee wave clouds 2. Stability 3. Jämtland Mountains, Sweden.**—*Author's abstract.*

6.7–262 551.576.1:551.558.21

Loewe, Fritz and Radok, Uwe, **A wave cloud at Heard Island.** *Weather*, 10(3):78–80, March **1955.** 4 figs., 2 refs. **DWB**—Account with photos of a spectacular lee-wave cloud, 3 miles behind 9000 ft conical peak. Upper air data are given. Base of the cloud was at 10,000–9,000 ft and top at 21,000 ft. *Subject Headings:* **1. Visible vortices 2. Heard Island.** —*C.E.P.B.*

6.7–263 551.576.11:551.578.11

Browne, L. C.; Day, G. J. and Ludlam, F. H., **Observations of small shower clouds.** *Meteorological Magazine*, London, 84(993):72-76, March **1955.** 3 figs., 5 photos, 4 refs. **DWB**—Summary of investigations of cumulus by aircraft over England Aug. 12–14, 1952. Diurnal variations of base and top heights are compared with condensation levels calculated from surface temperatures and dew points. Development process is discussed. Attempts at producing showers failed probably because clouds already had 1–5 giant nuclei per cu. meter, and slight showers occurred further north in clouds 5600–6000 ft deep. *Subject Heading:* **1. Cumulus cloud formation.**—*C.E.P.B.*

6.7–264 551.576.11:551.43

Hauer, H., **Über die Konvektionsbewölkung im Hochgebirge.** [On convection clouds in high mountains.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A,* 8(1/2): 35–44, **1955.** 3 figs., table, 4 refs. German, English and French summaries p. 35–36. **DWB**—Convection cloud formation over Zugspitze is compared with that over lowlands. On frontless days cumulus development may: 1) remain below peaks, 2) begin below peaks and envelop them, 3) begin or rise above peak level. Development depends on vapor pressure in the valleys; it is also related to position of anticyclonic center, 500 mb topography and pressure changes north of the Alps. Possibility of forecasting height of cumulus base is discussed. *Subject Headings:* **1. Cloud formation 2. Orographic effects 3. Zugspitze, Germany.**—*C.E.P.B.*

6.7–265 551.576.11:551.43

Scorer, R. S., **The growth of cumulus over mountains.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A,* 8(1/2):25–34, **1955.** 2 figs., 12 refs. English, German and French summaries p. 25–26. **DWB**—Cumulus clouds have a maximum by day over mountains and by night over lowlands and seas. By day surface temperature on mountains exceeds that at same level in free air and thermals arise supplied by anabatic winds. Above condensation level ascent or descent is governed by condensation or evaporation into clear air. The resulting small scale circulations by day and night are shown in diagrams. In addition, heating causes outflow aloft and a decrease of pressure below heated air; this sets up a circulation on a larger scale which may persist into the night. The resulting development at 2 km is illustrated. The problem of forecasting is best approached by comparing the situation on preceding days. *Subject Headings:* **1. Cloud formation 2. Orographic effects.**—*C.E.P.B.*

PRECIPITATION

See also: **Rainfall of Madras State** (Krishna Rao), 6.7 18; **High rate of rainfall** (Frith), 6.7–104; **Excessive rainfall** (Erikson), 6.7–150; **Water balance** (Penman), 6.7–249; **Precip. decrease** (Lauscher), 6.7–307; **Climatic change** (Schwerdfeger), 6.7–329; **Precip. and sunspot cycle** (Gillette), 6.7–330; *see also* special bibliography on **Radar Cloud Physics Studies,** p. 997.

6.7–266 551.577:551.515.8

Kéri, Menyhért and Szakács, Györgyné, **A felsikló és záporcsapadékok szétválasztása frontnaptár és öníró műszerek adatai nélkül.** [Separation of warm-front and shower precipitation without frontal calendar or data from recording instruments.] *Időjárás,* Budapest, 58(4):218–223, July/Aug. **1954.** fig., 3 tables. Russian and German summaries p. 218. **MH-BH**—The authors attempted to separate warm-front precipitation from shower precipitation at Budapest and Debrecen (1946–1949) by using only precipitation data and visual observations. Results are compared with those obtained by using air-mass-analysis data, with good agreement for the summer period but not for the winter period. The poor agreement for winter is attributed to the inaccuracy of visual observation. *Subject Headings:* **1. Frontal type precipitation 2. Precipitation data 3. Precipitation data analysis.**—*Trans. of authors' abstract.*

6.7–267 551.577.11

Fonselius, S. (*Inst. of Met., Univ. of Stockholm*), **Amino acids in rainwater.** *Tellus,* 6(1):90, Feb. **1954.** 2 refs. **DWB**—Albuminoid nitrogen has been found in rainwater (*see* Eriksson, 4.7–155, July 1953, *MAB*), but it has not been analyzed qualitatively. The author collected and evaporated large amounts of rain and snow water, in a vacuum until dry. The residues were subjected to paper chromatography. Spots were identified as glycine and α-alanine so it seems that amino acids are definitely present in rainwater in small quantities. So these amino acids (and 4 others) were synthesized by S. Miller (*Science,* 117: 528, 1953) by electric discharge in a closed system containing methane, ammonia, H_2O and nitrogen. *Subject Headings:* **1. Precipitation analysis 2. Amino acids in precipitation 3. Chemical analysis of rainwater.**—*M.R.*

6.7–268 551.577.11:551.510.41

Herman, F. A., **Discussion of: Content of nitrogen (NH_4–N and NO_3–N) in atmospheric precipitation by A. Ångström and L. Högberg.** *Tellus*, 16(1):89, Feb. **1954. DWB**—In Kentville, N. S. (Canada) during one year it was found that 2.004 pounds of NH_4—N and 0.907 pound of NO_3—N and 6.07 pounds of S (sulphur) were supplied to the soil (per acre) during one year (1952–3) by precipitation. The year was deficient in snowfall, so may not give a true picture. On Aug. 15, 1953 a cyclonic rainstorm gave 2.19 in. rain in one day, and zero readings of NH_4—N and NO_3—N were obtained for the first time. Precipitation for 24 hours at 10 stations from Norfolk, Va., to Yarmouth, N. S., showed heavy precipitation accompanying a tropical storm which moved up the coast (Atlantic City 7.29", Norfolk and Block Island 5.8" and 4.9"). It is thought that the nitrogen compounds had been entirely washed out before air reached Nova Scotia. (For abstract of original article *see item* 4.1–1, Jan. 1953, *MAB*.) *Subject Headings:* **1. Nitrogen content of precipitation 2. Precipitation analysis 3. Kentville, Nova Scotia. I. Ångström, A. II. Högberg, Linus.**—*M.R.*

6.7–269 551.577.2(791)

*Jurwitz, Louis R., **Rainfall in Arizona.** *Arizona Highways*, Phoenix, Arizona, 30(7):6–15, July **1954.** charts, tables, photos. (some in color). **DWB**—A popular account of the atmospheric circulation, of the storm systems affecting Arizona and their relationship to the atmospheric circulation, the mechanisms involved in generating summer and winter rainfall, and the amount and distribution of rainfall. Charts show average annual precipitation, and greatest 24-hour precipitation for Dec., Jan. or Feb., and July, Aug. or Sept. *Subject Headings:* **1. Precipitation amount 2. Precipitation distribution 3. Arizona.**—*I.L.D.*

6.7–270 551.577.2(728)

*Panama Canal Company. Engineering and Construction Bureau. Meteorological and Hydrographic Branch, **Climatological data for the Canal Zone, Feb. 1954.** 2 sheets, 14"×17". entirely tables. **DWB**—Rainfall data for the various stations in Panama Canal Zone for the month of February are given. They include daily totals in inches, monthly total departure from normal, number of days and hours with rain, maximum rainfall amounts for specific intervals and maximum, minimum and mean rainfall. *Subject Headings:* **1. Precipitation data 2. Panama Canal Zone.**—*I.L.D.*

6.7–271 551.577.2/3(493)

*Poncelet, L., **Le régime des précipitations sur les Hautes Fagnes.** [Precipitation regime for Hautes Fagnes.] *Belgium. Institut Royal Météorologique de Belgique, Contributions*, No. 12, **1954.** 11 p. 6 figs., 6 tables, ref. **DWB**—Precipitation data for period 1880–1950 for Baraque Michel, with some interpolations from nearby stations, are analyzed in numerous ways and the data synthesized in a remarkably thorough and logical fashion. Variability of total precipitation and number of days with precipitation; amount of melted snow and days with snow are given in addition to means and extremes for each month. Frequencies each month of precipitation in 5 mm class intervals from 0–5, to 125–130 mm, seasonal frequency of rainy periods (1–36 days) and heaviest fall in each period, number of rainy and dry periods of varying length, annual variability of each element and isohyetal charts showing examples of local distribution of precipitation of various amounts and various types, and finally the statistical distribution of amount of precipitation fallen as a function of area (1 to 10,000 sq km) in the June 24, 1953 storm compared with U.S.A. storms (Linsley and Kohler, 1949) are presented. *Subject Headings:* **1. Storm rainfall 2. Precipitation frequencies 3. Precipitation data 4. Long period records 5. Hautes Fagnes, Belgium.**—*M.R.*

6.7–272 551.577.21:551.588.2(47)

Buchinskiĭ, I. E., **Rel'ef i osadki.** [Relief and precipitation.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Izvestiia*, 86(2):196–201, March/April **1954.** 2 tables, 30 refs. **DLC**—Russian studies since about 1890 on the effect of elevations of 100–400 m upon precipitation amount are reviewed. The conclusion of most investigators is that such elevations increase the annual amount of rainfall in comparison to that at lower elevations in adjoining areas. On the basis of precipitation data from 38 stations (19 pair) in the Ukraine the author shows that moderate elevations definitely increase the monthly and annual rainfall amount and this is attributed

to increased evaporation and convection associated with the unevenesss of the terrain. *Subject Headings:* **1. Rainfall amount 2. Orographic effects 3. Ukraine, U.S.S.R.**—*I.L.D.*

6.7–273 551.577.22:551.501.45

Sneyers, R., **Sur une généralisation de l'indice de similitude de M. Bouët.** [On a generalisation of Bouët's similarity index.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 8(1/2):121–130, **1955.** 2 figs., 5 tables, 7 refs., 14 eqs. French, German and English summaries p. 121. **DWB**—BOUËT's index of similarity of rainfall at two stations A, B is replaced by one of the type

$$S_N = \frac{f - f_1 f_2 - g_1 g_2}{2\sqrt{f_1 g_1 f_2 g_2}},$$

where f_1, f_2, f are relative frequencies of rain-days at A, B and A, B simultaneously and $g = 1 - f$. Values of S_N are calculated for pairs of stations in Europe and plotted against distance d(km), giving $1000\, S(d) = 231 - 1.196(d - 103)$. *Subject Headings:* **1. Rainfall comparisons 2. Bouët's similarity index.**—*C.E.P.B.*

6.7–274 551.577.32:551.553.21

Drought ends in South India—normal northeast monsoon in 1953. *Indian Journal of Meteorology and Geophysics*, 5(2):191, April **1954. MH-BH**—A description of the synoptic situation associated with the appearance of normal northeast monsoon rains in 1953 after six years of drought. *Subject Headings:* **1. Synoptic conditions for rainfall 2. Monsoon rains 3. India.**—*I.L.D.*

6.7–275 551.577.34(94)

Cornish, E. A., **On the secular variation of rainfall at Adelaide.** *Australian Journal of Physics*, Melbourne, 7(2):334–346, June **1954.** 5 figs., 5 tables, 6 refs. **MH-BH**—A detailed analysis of the rainfall of Adelaide has established that periodic changes occur in the incidence and duration of the winter rains. These changes have a period and amplitude of approximately 23 years and 30 days, respectively, and superimposed on them is a long-term trend which is manifested by protraction of the later half of the season, spring rains now occurring about 3 weeks later than they did just over 100 years ago. The total quantity of rain precipitated has shown no statistically significant changes. *Subject Headings:* **1. Rainfall variations 2. Rainfall trends 3. Adelaide, Australia.**—*Author's abstract.*

6.7–276 551.577.37:551.577.61:551.579.4(77)

Brunk, Ivan W. (*U. S. W. B., Chicago, Ill.*), **The Chicago deluge of 9–11 October 1954.** *Weatherwise*, 7(6):160–162, Dec. **1954.** 2 figs. **MH-BH**—Highest water ever experienced in Chicago area followed the severe thunderstorms of Oct. 9–10, 1954 that broke all records for 24-hour rainfall since Aug. 1880 and all records for 48 hours (5.63″ in 24 hours and 6.72″ in 48 hours). In some suburbs 10–11 inches fell. Damage amounted to $10–15 million. Tracks in the Union Station were flooded and industries were forced to shut down. Isohyetal chart shows 48-hour rainfall in Chicago area, course of storm is described. *Subject Headings:* **1. Record rainstorms 2. Flood, Chicago (1954) 3. Excessive rainfall 4. Chicago, Ill.**—*M.R.*

RAIN

See also: **Raindrop coalescence** (Mason), 6.7–106; **Hailstone size forecasting** (Fawbush, Miller), 6.7–144; **Weather singularity** (Wahl), 6.7–169; **Shower clouds** (Browne, others), 6.7–263; **Microclimatic investigation** (Aulitsky), 6.7–316.

6.7–277 551.578:63

Kurelecz, Viktor, **Az időjárás hatása a legelőgyepekre.** [Effect of weather on pasture grass.] *Időjárás*, Budapest, 58(4):205–213, July/Aug. **1954.** 4 figs., 6 tables. Russian and German summaries p. 205. **MH-BH**—It is shown that for each millimeter of monthly precipitation there appears a certain amount of dry grass content. In the individual case there are considerable deviations from such general amounts. Hungary is divided into 38 regions

according to six types of summer climate, soil conditions and botanical properties. Differences in pasture grass in each of the regions are defined in terms of digestible albumin and of starch value. This is done on the basis of average accumulated temperature values for March–Oct. and of a chemical analysis of a number of pasture grass samples. *Subject Headings:* **1. Pastures 2. Precipitation effects.**—*Transl. of author's abstract.*

6.7–278 551.578.4:551.583.2

Nietsch, H., **Hochwasser, Auenlehm und vorgeschichtliche Siedlung. Ein Beitrag auf der Grundlage des Wesergebietes.** [Flood water, haugh loam and prehistoric settlement. A contribution on the basis of the Weser region.] *Erdkunde*, 9(1):20–39, Feb. **1955.** 8 figs., table, 28 refs. English summary p. 20. **DWB**—Magnitude and frequency of floods in Middle Weser since 1840 are related to severity of winters. Two types are distinguished, due to (a) snow melt following frost; (b) heavy rain. Summer floods are rare. During the post-glacial warm period frost floods were rare, and the existence of prehistoric settlements on the flood plain beneath the haugh (meadow) loam does not prove a drier climate. Pollen analyses show that filling in of river beds by clay occurred in the Atlantic period, but the haugh loam is probably later and due partly to deforestation and agriculture since 300 A.D., causing increased soil erosion. *Subject Headings:* **1. River floods 2. Historical climates 3. Weser River, Germany.**—*C.E.P.B.*

SNOW

6.7–279 551.578.41

Oura, Hirobumi and Kinoshita, Seiiti, **Measurement of free water content in snow by centrifugal separator.** *Low Temperature Science, Sapporo, Japan, Ser. A., Physical Sciences*, 12:61–72, **1954.** 6 figs., table, 13 refs. In Japanese; English summary p. 72. **DWB**—The free water content of snow was determined with the aid of a hand centrifuge. The results of measurement by this type of centrifuge are compared with those obtained with an electrically operated centrifuge. It is found that all the free water is separated by the water centrifuge within the range of experimental error and the water remaining after hand centrifuging is primarily the result of water tension. *Subject Heading:* **1. Water content of snow.**—*Based on authors' abstract.*

6.7–280 551.578.46(237):551.501

Beaumont, Robert T. (*Oreg. Agri. Ex. Station*), **Snow surveying in the western mountains.** *Weatherwise*, 7(6):147–148, 158, Dec. **1954.** 2 figs. **MH-BH**—A brief review of the history of snow surveys in the West, beginning with J. E. CHURCH's pioneer efforts on Mount Rose, Nevada, in 1910. The number of courses has increased from 3 in 1910 to 1202 in 1953. Modern methods and equipment are described and examples cited. *Subject Headings:* **1. Snow surveys 2. Western mountains, United States. I. Church, J. E.**—*M.R.*

6.7–281 551.578.46:625.76

Croce, Karl, **Moderne Maschinen im Kampf gegen den Schnee.** [Modern snow-fighting machines.] *Umschau*, 55(4):110–112, Feb. 15, **1955.** 9 figs. **DLC**—Owing to the difficulty of removing hard snow it should be cleared as soon as possible and without being compressed. The first machines were snow ploughs but their capacity is too small except against compacted snow. In German mountain country throwers are mostly used, driving the snow aside through a tangential outlet. Various sizes and types are described and illustrated. They can also be used for loading snow on to lorries and for clearing railways. *Subject Heading:* **1. Snow removal.**—*C.E.P.B.*

6.7–282 551.578.46(449.45)

Heybrock, Werner, **Zu den heutigen Firnverhältnissen auf Korsika.** [Present firn conditions in Corsica.] *Zeitschrift für Gletscherkunde und Glazialgeologie*, 3(1):75–78, Dec. **1954.** chart. **DLC**—After the snowy winter of 1950–51 author explored the mountains in summer 1951 and plotted the positions and heights of firn areas from 1870 m upwards. Two small glaciers exist at 2606 and 2670 m on Mt. Cinto. *Subject Headings:* **1. Firn 2. Corsica.**—*C.E.P.B.*

6.7–283 551.578.46:551.579.2

Himmel, James M. (*Coop. Snow Studies*), **Lysimeter studies of rain-on-snow phenomena.** *U. S. Corps of Engineers and U. S. Weather Bureau, Cooperative Snow Investigations, Research Note*, June 20, **1951.** 11 p. 6 figs. (1 fold). **DWB**—Artificial sprinkling of varying intensity and duration was applied to a 74′ long lysimeter plot, covered with snow. Automatically recorded runoff shows that the unit hydrograph principle can be applied to this case. Some suggestions for larger drainage basins are given. *Subject Headings:* **1. Lysimeter observation 2. Snow melt runoff.**—*A.A.*

6.7–284 551.578.46(497.1)

Kirigin, B., **Die Schneeverhältnisse in den Gebirgsgegenden von Groski Kotar und Medvenica (Jugoslawien).** [Snow conditions in mountain regions of Gorski Kotar and Medvenica, Yugoslavia.] *Wetter und Leben*, Vienna, 5(7/9):154–157, **1954.** 3 figs., 3 refs. **MH-BH**—The author discusses the dependence of snow duration upon height above sea level and the effect of winter precipitation upon duration of snow cover. *Subject Headings:* **1. Snow cover duration 2. Altitude influences 3. Yugoslavia.**—*I.L.D.*

6.7–285 551.578.46(234.3)

Roller, Maria, **Normalwerte der Schneedichte in den Ostalpenländern.** [Standard values of snow density in the East Alpine countries.] *Wetter und Leben*, Vienna, 6(3/4):50–53, June **1954.** fig. **MH-BH**—Data on snow density frequencies in the eastern Alps collected since 1901 are summarized according to snow thickness, height above sea level and season, and are presented tabularly. The annual variation of snow density with elevation above sea level is presented graphically. Snow densities increase with elevation and are higher in spring than in winter. *Subject Headings:* **1. Snow density 2. Eastern Alps.**—*I.L.D.*

HYDROMETEOROLOGY

See also: **Plant climate** (Searle), 6.7–4; **Water balance** (Penman), 6.7–249; **Chicago deluge** (Bunk), 6.7–276; **Lysimeter studies** (Himmel), 6.7–283.

6.7–286 551.579

Csermák, Béla, **A regionális vízgazdálkodási tervezés.** [Planning regional water schemes.] *Vízügyi Közlemények*, Budapest, No. 2:239–250, **1954.** 3 figs., eq. Russian and German summaries p. (37)–(39). **DLC**—A plan of regional water economy—it is explained—should consist of: 1) general description of the region's geography, geology, climate, hydraulic structures, navigation, etc., 2) evaluation of available surface and underground water resources, 3) statement of the water requirement, 4) project for the utilization of resources and 5) administrative plan. Details to be included are discussed for each of these suggested sections. *Subject Headings:* **1. Water conservation 2. Water resources.**—*G.T.*

6.7–287 551.579:519.24

Harding, J. P., **The use of probability paper for the graphical analysis of polymodal frequency distributions.** *Marine Biological Association of the U.K. Cambridge, Journal*, 28:141 153, **1949.** 6 figs., 2 tables, 9 refs. **DLC**—The probability paper devised by A. Hazen in 1913 for analysis of river flow is described with biological examples for data 1) expressed as a frequency distribution, 2) arranged in order of magnitude. A polymodal example is made by mixing three hypothetical normal populations. The curve on probability paper shows two points of inflexion which give the approximate proportions in which the populations are mixed. *Subject Headings:* **1. Statistical methods in hydrology 2. Stream flow.**—*C.E.P.B.*

6.7–288 551.579:551.501.9

Kallós, Imre, **A vízgazdálkodási vonatkozású állomások nyilvántartása.** [Listing of hydrologic stations.] *Időjárás*, Budapest, 58(4):233–237, July/Aug. **1954.** fig., tables. Russian and French summaries p. 233. **MH-BH**—Suggests improvements in the assignment of station numbers to hydrologic stations, including precipitation stations. The numbers issued to stations determine their order of listing in hydrologic reports. *Subject Heading:* **1. Hydrologic stations.**—*G.T.*

6.7–289 551.579

Machado, Emilio A. M. and Marchetti, Adolfo A., **El análysis secuencial y su aplicación a la hidrología.** [Sequential analysis and its application to hydrology.] *Meteoros*, Buenos Aires, 4(1/2):35–54, Jan./June **1954.** 6 figs., 7 tables, 5 refs., 25 eqs. Spanish and English summaries p. 35. **MH-BH**—The method of sequential analysis which depends upon previously made observations rather than on a-priori determined number of necessary observations is applied to determine the volume of a stream. The theory of sequential analysis is presented and its practical applications are discussed, with reference to the application of the binomial distribution for determining the dimensions of a hydroelectric installation. *Subject Headings:* **1. Sequential analysis 2. Stream flow 3. Hydrology.**—*I.L.D.*

6.7–290 551.579(85)

*Portocarrero y C., Juan N., **Hidrología. Contribución al estudio hidrológico del territorio Peruano.** [Contribution to the hydrology of Peru.] *Lima, Peru. Universidad de San Marcos. Instituto de Geografía, Revista*, No. 1:80–112, **1954.** mostly tables. **DWB**—Total annual discharge (1912–1920) and maximum discharge amounts (1912–1923) are tabulated for the Peruvian rivers. Presented also are: (a) hydraulic potentials (min. and average energy available), (b) annual sedimentation as a function of catchment area and (c) listing of years with unusual floods (beginning with 1567). *Subject Headings:* **1. Hydrologic data 2. Peru.**—*G.T.*

6.7–291 551.579:551.573

Siren, Allan, **The drainage basin evaporation in Finland.** *I.U.G.G., International Association of Scientific Hydrology, [Transactions], Oslo*, 1948, 1:129–130, [n.d.] 2 figs., table, eq. **DWB**—Data for precipitation (P), evapotranspiration (E), summer temperature (t) from April–Oct., percentage of lakes (L) and area (A) of 40 river basins in Finland, and evapotranspiration maps are presented. In the considered temperature range (5–10°C), the formula $E=57t-235$ gives a correlation coefficient of 0.97, E slightly increasing with P. No clear relationship between L, A and E was found. *Subject Headings:* **1. Hydrologic cycle 2. Evapotranspiration 3. Finland.**—*A.A.*

6.7–292 551.579:551.573

U. S. Corps of Engineers, **Precipitation, evapotranspiration and runoff, Willamette Basin Snow Laboratory.** Its *Snow Investigations Research Note*, No. 20, July 30, **1954.** 26 p. 2 plates (fold.), 4 tables. 31 refs., appends. **DWB**—Method of generalizing rainfall, evaporation and runoff data from gage measurements to a small basin (Willamette Basin in Cascades of Oregon) is described and results presented and analyzed. Yearly mean precipitation calculated for basin as runoff plus evapotranspiration is considered more accurate for basin as a whole than when calculated from rain gage data, even though there is one gage per square mile. Potential evapotranspiration is calculated according to Thornthwaite's method. Isohyetal maps are drawn for the basin to show gage catch deficiencies for 15 year period. Mean gage catch deficiency for 15 gages was 14% in 1949–50 and 17% in 1950–51. These are said to be low deficiencies because high mean wind speeds prevailed during these years, but since precipitation averages >100″ a year, the total precipitation deficiency is considerable. Areal distribution is shown in maps and discussed. *Subject Headings:* **1. Hydrologic cycle 2. Rain gage networks 3. Evapotranspiration 4. Willamette Basin, Oregon.**—*M.R.*

6.7–293 551.579.2:551.481.1

*Riesbol, Herbert S., **Snow hydrology for multiple-purpose reservoirs.** *American Society of Civil Engineers, Proceedings*, vol. 79, Separate No. 189, May **1953.** 19 p. 6 figs., 5 tables, refs. **DLC**—In the West, maximum use of storage space in multiple purpose reservoirs (for irrigation, hydroelectric power, flood-control, navigation and minor purposes such as fish preservation, salinity and pollution control) can be achieved only by having accurate forecasts or estimates of flood hydrographs which would mainly be based on forecasts of snow melt during the critical 15-day period in spring. Rainfall and temperature anomalies can be forecast only a short time in advance but snow melt runoff can be forecast with considerable confidence by means of nomograms and formulas worked out on the basis of studies of snow physics in relation to air temperature (degree-days), rainfall, etc., by WALTER T. WILSON, R. W. GERDEL

PHILLIP LIGHT, J. P. PAULSON and others. Many of these studies are summarized in detail in this paper. *Subject Headings:* **1. Snow hydrology 2. Snow melt forecasts 3. Multiple purpose reservoirs.**—*M.R.*

6.7–294 551.579.3:551.573:551.311.12

Il'in, I. A., **Materialy k poznaniiu uslovii formirovaniia rechnogo stoka iz oblasti lednikov.** [Material for study of conditions of runoff formation from glaciers.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Izvestiia*, 86(2):156–168, March/April **1954.** fig., 3 tables. **DLC**—This detailed and comprehensive study of the Tamyngen Glacier which is in the basin of the Istor River on the northern slope of the Turkestan ridge was carried out during July 28-Sept. 13, 1938. The author discusses the dynamics of the glacier, the melting of its surface, evaporation and condensation on its surface (data in a table) the regime and magnitude of flow of water from the glacier and moisture balance in the region of the glacier. The daily meteorological observations made during the interval of investigation are given in a table. *Subject Headings:* **1. Glacial runoff 2. Glacial ablation 3. Tamyngen Glacier, U.S.S.R.**—*I.L.D.*

6.7–295 551.579.4 627.51

Bose, N. K. (*River Res. Inst., West Bengal*), **Floods and measures for flood control.** *Science and Culture*, 20(3):117–118, Sept. **1954. DWB**—Floods do not always result in damage. In many parts of India the milder floods keep the land fertile, whereas only the more intensive floods are catastrophic. Flood control should take account of the fact that rich soil may be deposited over a wide area if the muddy waters are allowed to spread out over a flood plain yet remain under control. Severe erosion results from uncontrolled flooding. *Subject Headings:* **1. Flood erosion 2. Flood control 3. India.**—*M.R.*

6.7–296 551.579.4(436)

*Kletter, L., **Die Hochwasserkatastrophe in Österreich im Juli 1954.** [The flood catastrophe in Austria in July 1954.] *Wetter und Leben*, Vienna, 5(7.9):175–163, **1954.** fig., 2 tables, 5 refs. **MH-BH**—The author discusses the precipitation conditions in central Europe during April, May and June 1954 preceding the floods, the weather situations over Europe during July and the courses of the floods. Data are given on water level measurements on the Danube from July 1 to July 15, 1954, and precipitation during the first decade in July for various situations. *Subject Headings:* **1. Flood analysis 2. Flood data 3. Austria.**—*I.L.D.*

6.7–297 551.579.4

§Zách, Alfréd, **Az 1954 júliusi árviz meteorológiája.** [Meteorological analysis of the floods of July 1954.] *Időjárás*, Budapest, 58(4):248–251, July/Aug. **1954.** 4 figs. **MH-BH**—The Danube flood of July 1954 was of the order of magnitude expected to occur only once in a century. It was caused by excessive precipitation in the Alps. The synoptic situation which led to that precipitation is discussed and shown in charts. *Subject Headings:* **1. Floods 2. Flood analysis 3. Danube River.**—*G.T.*

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY

See: **Engr. clim.** (Humphrey, Wilkins), 6.7–99.

CLIMATE OF PARTICULAR PLACES

See also: **Climate of the world** (Alisov), 6.7–9; **Marine atlas** (Bullig), 6.7–83; **Physics and agric.** (Ioffe), 6.7–103; **Mean temp. and precip.**, 6.7–117.

6.7–298 551.582(669) 551.506.3(669)

*Port Harcourt, Nigeria. Tropical Testing Establishment, **Report on meteorological data for certain places in Nigeria.** It's *Technical Report* no. 240. **1954.** 28 p., 40 figs., 16 tables.

Mimeo. **GB-MO**—The instruments used are described with photographs. Main stations are Port Harcourt, Nkpoku (jungle clearing and undergrowth), Kano (semi-desert) and Lagos (beach), with some auxiliary stations. Results are shown for thirds of months in tables and graphs or histograms, with typical autographic charts. They include temperature (shade, sun and grass minimum), humidity, sunshine, rain (amount, intensity, diurnal variation), dew point, dew deposition, wind speed and barometric amplitude. *Subject Headings:* **1. Climate of Nigeria 2. Nigeria.**—*C.E.P.B.*

6.7–299 551.582(72)

Termer, Franz, **Die Halbinsel Yucatan.** [Yucatan peninsula.] *Petermanns Geographische Mitteilungen, Ergänzungsheft*, No. 253, **1954.** 26 photos, 3 charts, tables, refs. **DLC**—Pt. 1 deals with early history. Pt. 2 covers physical-geographical factors in relation to population. This includes climate, p. 12–17, with a brief table for 8 stations extended by reports of travellers. The climate is regarded as favorable but cold air incursions (nortes) and especially droughts cause disease and famine. Hurricanes occur about once a century. Pt. 3 deals with plant and animal life and Pt. 4 with economic geography from pre-Spanish to present times. *Subject Headings:* **1. Climate of Yucatan 2. Yucatan.**—*C.E.P.B.*

6.7–300 551.582.1:551.588.7(52)

Asakawa, Tomio, **The climate of Nagano City and the atmospheric currents in the valley of the river Susobana.** *Journal of Agricultural Meteorology*, 9(1):13–16, Dec. **1954.** 4 figs., 5 tables. In Japanese; English summary p. 16. **MH-BH**—The climate of Nagano City is of the inner Japanese type, characterized, especially in winter, by considerable cloudiness, moisture, snow and mildness. The city has a typically urban climate; there is a marked difference between the city and its surroundings in values of temperature, humidity, frost, wind, fog, etc. What the author calls "the atmospheric currents of the Susobana" passes through the center of the city from west to east, strongly affecting temperature, humidity, wind, frost and other meteorological elements. *Subject Headings:* **1. Climate of Nagano City, Japan 2. Urban climates 3. Nagano City, Japan.**—*Author's abstract.*

6.7–301 551.582.1(86)

*Trojer, Hans, **El tiempo reinante en Colombia. Sus características y su desarrollo, Pt. 1, Estudios básicos para una climatología dinámica de Colombia.** [Weather in Colombia. Its characteristics and progress, Pt. 1, Basic studies for a dynamic climatology of Colombia.] *Centro National de Investigaciones de Café, Chinchiná, Boletín Técnico*, 2(13), **1954.** 43 p. 10 tables, 13 diagrs., 14 refs. Spanish, German and English summaries, p. 35–42. **DWB**—With the aid of diagrams, tables and charts the author describes the characteristics of the meteorological variables, namely: distribution of atmospheric pressure and air currents over Colombia, including wind distribution up to an altitude of 5000 m., precipitation distribution, both spatial and seasonal, air mass characteristics and their relationship to large scale weather, diurnal variations of temperature, relative humidity, wind, cloudiness and pressure. The influence of orographic factors upon weather is discussed. *Subject Headings:* **1. Descriptive climatology 2. Climate of Colombia 3. Orographic influences 4. Colombia.**—*I.L.D.*

6.7–302 551.582.2(773)

*Argonne National Laboratory, Lemont, Illinois, **Summary of meteorological data taken at Argonne National Laboratory, Du Page County, Illinois, July 1952 through June 1953 by the Meteorology Section, Radiological Physics Division.** Contract W-31-109-eng-38 (Report) ANL-5256, April **1954.** 143 p. 8 figs., 89 tables (some folded). **MH-BH**—This report is the fourth in a series of interim reports on the climatological studies which are being conducted at the Argonne National Laboratory. The first three of these reports appeared as ANL documents—ANL-4538, ANL-4793 and ANL-4928. The present report, like ANL-4928, contains data on wind frequencies and wind speed, temperature, relative humidity, joint frequency distribution of temperatures and relative humidity, solar and sky radiation and pressure. An added feature of this report is the soil temperature data at depths of 1 cm, 10 cm, 20 cm, 50 cm, 100 cm, and 10 ft and 29 ft. The appendix contains a map showing the location of the meteorological site and a diagram of the arrangement of the instruments.

Subject Headings: **1. Climatic data summaries 2. Soil temperature data 3. Du Page County, Illinois.**—*I.L.D.*

6.7–303 551.582.2(64)

*Bidault, G., **Notes sur le climat du Maroc Oriental.** [Notes on the climate of Eastern Morocco.] *Rabat, Morocco. Institut Scientifique Chérifien. Service de Physique du Globe et de Météorologie, Recueil des Publications*, No. 6, **1953.** 12 p. 6 tables, 5 figs. (1 fold.), ref. **DWB.** Reprint from: *Maroc-Medical*, No. 342:32–53, **1953.** This article contains tabular data on monthly mean of daily duration of insolation, mean monthly, mean maximum, mean minimum and absolute maximum and minimum temperature for Jan. and July and seasonal precipitation amounts for various climatic regions, annual wind frequencies for 0700, 1300 and 1800 hours, mean monthly and annual values of wind force, mean monthly values of absolute and relative humidity, for 0700, 1300 and 1800 hours, mean monthly evaporation, etc. Also the regional classification of eastern Morocco is attempted and is shown on a map. *Subject Headings:* **1. Climatic data 2. Climate of Eastern Morocco 3. Eastern Morocco.** —*I.L.D.*

6.7–304 551.582.2(728.4)

*Flanagan, Jeff E.; Molina, José and Escobar M., Carlos (*all on staff of the Centro*), **Datos climatológicos de El Salvador.** [Climatological data for El Salvador.] *El Salvador. Centro Nacional de Agronomía, Boletín Técnico*, No. 17, Oct. **1953.** 82 p. 57 tables., fig. **DWB**—Monthly and annual precipitation data for 3 to 40 years are summarized and presented in extenso, for 63 rainfall stations in El Salvador. Five climatic zones are recognized. Temperature, humidity and wind data are also presented for 1 to 5 stations operating since 1912. Histograms show comparative average monthly rainfall amounts for the 5 major stations. May to Oct. are the rainy months, with 95% of the years rain falling then. Nov. through April are dry, with about 5% of the annual of about 1700 mm (70 inches) during that period. *Subject Headings:* **1. Precipitation data summaries 2. Climate of El Salvador 3. El Salvador.** —*M.R.*

CLIMATIC CHANGES

See also: **Glacier variations** (Lawrence), 6.7–33; **Flood water** (Nietsch), 6.7–278.

6.7–305 551.583:551.1

Dawkins, H. C., **Northern Province mountains. Speculations on climate and vegetation history.** *Uganda Journal*, Kampala, 18(1):58–64, March **1954.** 4 figs. **DLC**—Profiles and a study of the geomorphology of the Acholi and Karamoja Districts of Northern Uganda (Imatong Mountains) lead to the conclusion that the area was once arid (sheet-wash without aeolian deposits) with short heavy storms but not sufficient rain to support vegetation. Later the rainfall must have been uniform and much heavier, allowing for deep young gulleys to form in the detritus of the larger valleys, indicating vegetative cover over the detritus area and the whole basin—otherwise gulleys would have formed in the smaller valleys as well as the larger. *Subject Headings:* **1. Climatic changes 2. Vegetation influences 3. Geomorphology 4. Uganda.**—*M.R.*

6.7–306 551.583

Dunbar, M. J., **A note on climatic change in the sea.** *Arctic*, 7(1):27–30, June **1954.** 12 refs. **DLC**—The warming up of the world's climate involving an increased northward and southward flow of Atlantic and Arctic waters, respectively, leads to buffering in East Greenland and the Canadian Eastern Arctic and differential climatic change in these areas as compared with West Greenland and Spitsbergen. The evidence for climatic amelioration in these areas since about 1870 is reviewed. It is shown that the Dugova Bay area had a milder climate in the decade of 1880 than at present. A possible explanation for this phenomenon is sought in the relative volume transport and velocities of the Atlantic Drift system in the two periods. *Subject Headings:* **1. Climatic variations 2. Warming of Arctic 3. Climatic amelioration 4. Arctic.**—*I.L.D.*

6.7–307 551.583:551.577.3

*Lauscher, Friedrich, **Nimmt der Niederschlag auf der Erde wirklich ab?** [Is the precipitation on earth really decreasing?] *Geographische Gesellschaft, Vienna, Mitteilungen*, 93(7–12):123–130, **1951.** 2 tables. **DLC**—Mean annual precipitation for 104 stations in all parts of the world is compared for 1881–1910 with similar means for 1911–1940, showing that the precipitation for the Southern Hemisphere has decreased markedly, but for the Northern Hemisphere only slightly—in fact the Jan. precipitation has increased for the second 30-year period in the Northern Hemisphere. Data are summarized by 20° squares of lat. and long. for the earth (70°N to 30°S) showing great decrease in tropics but increase in polar regions. Changes in Köppen's classification limits are also tabulated. *Subject Headings:* **1. Climatic variations 2. World rainfall variations 3. Northern Hemisphere 4. Southern Hemisphere.** —*M.R.*

6.7–308 551.583:523.74

Miette, R., **Non! Les saisons ne sont pas décalées!** [No! The seasons do not change!] *L'Astronomie*, 68:148–151, April **1954.** **DWB**—Popular discussion of climatic variations in relation to sunspot cycles of various lengths, with the general idea that cold, warm, dry and wet years keep repeating after years of the opposite character, so there is "nothing new under the sun" with respect to weather. *Subject Headings:* **1. Climatic variations 2. Sunspot cycles.** —*M.R.*

6.7–309 551.583.13

Brier, Glenn W. (*U. S. Weather Bureau, Wash., D. C.*), **A note on singularities.** *American Meteorological Society, Bulletin*, 35(8):378–379, Oct. **1954.** fig., 3 refs. **MH-BH**—The circulation singularities associated with the Jan. thaw are investigated. The meridional index M at 50°N for the entire Northern Hemisphere computed from daily pressures at every 10° long. was taken as an index of the general circulation for every even-numbered day in Jan. from 1899 to 1939. The fluctuations of the 41-year average curve of the 10 best years and of 31 years are found to have the same basic features. Comparing these curves with BAUER's suggestion that rainfall singularities are due to meteoric dust the author concludes that the Jan. rainfall singularities are related to circulation changes. *Subject Headings:* **1. Singularities 2. General circulation 3. Rainfall singularities 4. Northern Hemisphere.**—*I.L.D.*

6.7–310 551.583.13

Brooks, C. E. P., **On month to month persistence and on 7-day periodicity.** *American Meteorological Society, Bulletin*, 35(7):314, Sept. **1954.** **MH-BH**—The author presents a table giving correlation coefficients between surface pressure in successive months and indicating some real month-to-month persistence, which is attributed to the persistence of variations in the area of Arctic ice from month to month and its influence upon pressure distribution. Also 7-day periodicities are real and their length represents the life-time of a Bjerknes family of depressions with the intervening anticyclones. *Subject Headings:* **1. Persistence 2. Periodicities 3. Seven-day periodicities.**—*I.L.D.*

6.7–311 551.583.14:523.74

*Okayama, Taisuke; Konishi, Toshio and Negoro, Nobuyuki, **Many-dimensional formulation of physical laws, Pt. 2. Sun-spots and secular change of climate.** *Osaka. University of Liberal Arts and Education, B, Natural Science, Memoirs*, No. 2, **1953.** 15 p. 14 figs., 6 tables, 10 refs. Abstracted from reprint. **DWB**—The authors summarize previously proposed theory in which all material phenomena are described as energy fluxes in many dimensional spaces (Memoir of Osaka Gakugei Univ. No. 1, 1952) so that the number of sunspots is roughly proportional to the 4th dimensional relative velocity of the earth and sun; solar radiation and hence the earth's climate are proportional to the volume of the 3-dimensional cross section of the sun; and climatological singularity dependent on different sections of the sun. The 22-year oscillation of solar diameter, the relationship between solar diameter and climate, the cycle of past climates and of predicted climates are discussed. *Subject Headings:* **1. Sunspot effects 2. Climatic variations.**—*I.L.D.*

6.7–312 551.583.2:551.311.12(234.3)

Heuberger, Helmut, **Gletschervorstösse zwischen Daun- und Fernau-Stadium in den nördlichen Stubaier Alpen (Tirol).** [Glacial advances between Daun and Fernau stadia in the northern Stubaier Alps.] *Zeitschrift für Gletscherkunde und Glazialgeologie*, 3(1):91–98, Dec. **1954.** 6 figs. **DLC**—A number of moraines are mapped in several valleys and related to glacial advances. During post glacial warm period glaciers nearly vanished. Much before 1600 A.D. snowline descended 600–800 m but advance of glaciers was relatively small. A greater advance occurred about 1600; the subsequent retreat was interrupted by smaller advances in 1850 and 1920. *Subject Headings:* **1. Glacial advances 2. Alps.**—*C.E.P.B.*

6.7–313 551.583.3:581.9:634.94

†Frenzel, Burkhard, **Die Vegetationszonen Nord-Eurasiens während der postglazialen Wärmezeit.** [Vegetation zones of north Europe during the Post-glacial warm period.] *Erdkunde*, 9(1):40–53, Feb. **1955.** 4 figs., chart, 58 refs. English summary p. 40, German p. 52. **DWB**—A review article based mainly on Russian literature. Tundra proper was restricted to small areas on Yamal, Gyda and Taimyr peninsulas. Forest tundra extended to Arctic Ocean except east of Taimyr peninsula and was largely birch. In NE, northern and southern limits of taiga lay further north than now. Steppe extended into taiga, especially in central Siberia, loess steppe reached a height of 1000 m, deserts were originated and lakes shrank. *Subject Headings:* **1. Postglacial warm period 2. Forest limits 3. Russia.**—*C.E.P.B.*

6.7–314 551.311.12:551.583.3

Manley, Gordon, **On the occurrence of ice domes and permanently snow-covered summits.** *Journal of Glaciology*, 2(17):453 456, April **1955.** 3 figs. English and German summaries p. 453. **DWB**—From a discussion of snow caps on rounded hill tops relations are drawn between breadth of snow summit and height of summit above general firn line if it is to carry a permanent snow cap. From this inferences are made as to height of snow line in Britain in Quaternary, and eastward decrease of precipitation. *Subject Headings:* **1. Ice domes 2. Quaternary climates.**—*C.E.P.B.*

MICROCLIMATOLOGY

See also: **Plant climate** (Searle), 6.7–4; **Alpine met-gy** (Langlo), 6.7–61; **Arid zone research** (Langlo), 6.7–62.

6.7–315 551.584:626.8

Budyko, M. I. and Pogosian, KH. P., **Izmenenie klimata prizemnogo sloiia vozdukha pri melioratsii zasushlivykh raïonov.** [Change in climate of air near the ground during melioration of dry regions.] *Priroda*, Moscow, 5:45–51, May **1954.** 3 figs., ref. **DLC**—A brief review of Soviet research in micrometeorology carried out in connection with the extensive program of reclamation and afforestation is presented. The effect of irrigation and afforestation upon moisture balance, evaporation, wind velocity, turbulent air movement, and radiation balance in the atmospheric layer near the ground are discussed qualitatively. *Subject Headings:* **1. Micrometeorological research 2. Reclamation 3. Reforestation 4. U.S.S.R.**—*I.L.D.*

6.7–316 551.584.41:551.578.46:624

Aulitsky, H., **Über mikroklimatische Untersuchungen an der oberen Waldgrenze zum Zwecke der Lawinenvorbeugung.** [On microclimatic investigation at the upper forest limits for the purpose of avalanche prevention.] *Wetter und Leben*, Vienna, 6(5/6):93–99, Aug. **1954.** 3 figs., 6 refs. **MH-BH**—In connection with the afforestation program initiated in the Tyrol to prevent avalanches, micrometeorological investigations were carried out in 1943 at a height of 1950 m above sea level. In this study the author describes the degree to which forest stands at this altitude influence individual climatic factors, the degree to which vegetation near the ground exerts an equalizing effect and the response of young woody plants to environmental influences. The microclimatic elements examined were temperature, wind, radiation and

moisture. *Subject Headings:* **1. Forest microclimatology 2. Forest influences 3. Avalanche prevention 4. Tyrol, Austria.**—*I.L.D.*

6.7–317 551.584.7:551.521.32

Bensin, Basil M., **Created microclimate for growing warm-season vegetables with solar reflectors and radiators in Alaska.** *Alaskan Science Conference, 2nd, Mt. McKinley National Park, Sept. 4–8, 1951, Proceedings*, p. 272–273, pub. [1953?] **DWB**—The microclimate of growing vegetables was changed by using solar reflectors in connection with cold frames, and by increasing absorption of solar heat on soil by means of spreading coal dust over the soil surface. These experiments were made at Circle Hot Springs, Alaska, in the summer of 1951. *Subject Headings:* **1. Solar reflectors 2. Solar heat absorption by soil 3. Circle Hot Springs, Alaska.**—*M.R.*

CLIMATIC CLASSIFICATION

6.7–318 551.585.1

Péczely, György, **A mediterrán klímajelleg ingadozásai Magyarországon.** [Fluctuations of Mediterranean factors in the climate of Hungary.] *Időjárás*, Budapest, 58(4):2147,–21 July/Aug. **1954.** 2 figs., 4 tables, 4 refs. Russian and French summaries p. 214. **MH-BH**—The author introduces an index number expressing degree of influence of the Mediterranean on the climate in terms of deviation of monthly mean temperature and precipitation values from a standard Mediterranean series. On the basis of this index number the scalar variations and long-term periodicities of Mediterranean climatic influence are derived from temperature and precipitation records of Budapest covering the period 1841–1953. The most marked ones among the periodicities identified show good agreement with ABBOT's periodicities of the solar constant. *Subject Headings:* **1. Oceanic influences 2. Periodicities 3. Climate of Hungary 4. Hungary.**—*Trans. of author's abstract.*

6.7–319 551.585.7(237)

Shanks, Royal E. (*Dept. of Botany, Tennessee Univ., Knoxville*), **Climates of the Great Smoky Mountains.** *Ecology*, Durham, N. C., 35(3):354–361, July **1954.** 5 figs., 2 tables, refs. **DLC**—The general pattern of mountain climates in the Great Smoky Mountains of Tennessee based on 5 years of records was analyzed in connection with a study on the behavior of tree species at or near their climatic limit. Temperature decreases gradually up to 5000 ft by an average of 10–15°F and precipitation increases gradually upward from the base of the mountains. Either of THORNTHWAITE's systems of climatic classification (that is the 1931 and 1948 systems) is adequate for differentiating the climates at different altitudes. The studies however indicate the need for reversing the Southern Appalachian portion of THORNTHWAITE's (1948) maps of moisture regions in the United States and average annual thermal efficiency. *Subject Headings:* **1. Mountain climates 2. Thornthwaite's classification 3. Great Smoky Mountains, Tennessee.**—*I.L.D.*

BIOCLIMATOLOGY

See also: **Bioclimatic tower stations** (S—), 6.7-51; **Sunlight effects** (Blum), 6.7–196; **Insolation** (Wagner, Dinger), 6.7–197.

6.7–320 551.586(494)

Mörikofer, W., **Das Bioklima der Schweiz.** [Bioclimatology of Switzerland.] *Bibliotheca Tuberculosea*, Basel, Fasc. 7:22–39, **1954.** 3 tables, 5 refs. **DSG**—After describing briefly the effect of topography in Switzerland upon the general climate the author discusses the radiation and isolation conditions including the dependence of UV-intensity and cloud cover upon elevation, annual variations of sunshine duration for various elevations (given in a table), mean duration of solar radiation, characteristics of air temperature and sensible temperature, dependence of wind intensity upon elevation, precipitation, relative humidity, cloudiness and chemical composition of the atmosphere. A regional bioclimatology of Switzerland is presented. *Subject Headings:* **1. Bioclimatology of Switzerland 2. Switzerland.**—*I.L.D.*

6.7–321 551.586:519.241.2:616

Baur, Franz, **Mathematisch-statistische Prüfung der zeitlichen Häufung von Todesfällen.** [Statistical analysis of the time relations of deaths.] *Annalen der Meteorologie, Medizin-meteorologische Hefte*, No. 10:1–4, **1955.** table, 2 eqs. **DWB**—Hourly deaths (0–4) in Wiesbaden 1948–50 were subjected to an iteration process. The number of observed sequences were many times the mathematical expectancy, by amounts exceeding chance limits. *Subject Headings:* **1. Bioclimatology 2. Statistical studies 3. Deaths.**—*C.E.P.B.*

6.7–322 551.586:612.1

Jungmann, Horst, **Kreislaufumstellungen im Nordseeklima.** [Circulation change in the North Sea climate.] *Annalen der Meteorologie, Medizin-meteorologische Hefte*, No. 10:9–15, **1955.** 2 figs., table, 17 refs. **DWB**—A change of circulation in 25 sick patients from the Ruhr during a 4-week stay on Alderney in spring 1954 is described. The adaptation phase lasting about 3 weeks consisted of an increase of pulse rate, elastic resistance, etc. Comparative observations at Hamburg and on mountains showed that this reaction is typical for the North Sea climate. *Subject Headings:* **1. Climatotherapy 2. North Sea.**—*C.E.P.B.*

6.7–323 551.586:612

King, Erwin, **Ein empirisches Schwülemass.** [An empirical measure of sultriness.] *Annalen der Meteorologie, Medizin-meteorologische Hefte*, No. 10:5–8, **1955.** 4 figs., 22 refs. **DWB**—Feeling of sultriness is due to a decrease of heat loss. Four healthy subjects independently estimated sultriness in Tübingen on a scale of 0–3. Results are plotted against equivalent temperature and (1) counter radiation (2) cooling power, and a nomogram is constructed. The calculated and observed degrees of sultriness agree well. *Subject Headings:* **1. Sultriness 2. Cooling power.**—*C.E.P.B.*

6.7–324 572 551.586:612

Van de Water, Marjorie, **Negro ancestor for man?** *Science News Letter*, 65(23):362, June 5, **1954.** **DWB**—An American anthropologist, Dr. Curleton S. Coon (Univ. of Penna.) suggests, that skin color, curliness of hair, body size or shape, size of extremities (hand and feet), fat layers, flatness of face, nose and eyes and amount of beard may be survival mechanisms that develop in various races to some extent, affording protection from heat or cold, solar radiation or lack of sunshine, humidity or dryness and other climatic factors of the Arctic, tropics, desert, marine or temperate zone (where extremes of heat and cold occur). Some anthropologists dispute this theory. *Subject Headings:* **1. Climatic factors in evolution 2. Acclimitization 3. Anthropology.**—*M.R.*

6.7–325 551.586:612.2

Spangenberg, W. W., **Zur Klimatisation der Atemluft. Eine bioklimatische Betrachtung.** [On the climatization of breathed air. A bioclimatic consideration.] *Angewandte Meteorologie*, 2(4):110–118, Jan. **1955.** 5 figs., 4 tables, 13 refs. **MH-BH**—Inspired air must be suited to the condition of the mucous membrane if breathing is to be natural. This climatisation (warming, humidifying and cleaning) takes place by stages. A number of measurements of temperature and of parts of the breathing apparatus are described, under various conditions of nose and mouth breathing. The factors of difficult breathing are analyzed. *Subject Headings:* **1. Bioclimatology 2. Respiration.**—*C.E.P.B.*

6.7–326 551.586:615.834

Riesz, Ede; Pál, István and Konek, László, **Gyógyhely-klimatológiai vizsgálatok a Mátrában.** [Climatological investigation of health resorts in the Mátra Mountains.] *Időjárás*, Budapest, 58(4):197–205, July/Aug. **1954.** 18 refs. Russian and French summaries p. 197. **MH-BH**—Biologically relevant climatic properties of Mátraháza, Hungary (el. approx. 2000 ft) are outlined (sunshine duration, solar and sky radiation, cloudiness, precipitation, humidity, visibility, pressure, wind conditions, frequency of frontal passages). As a result of a survey made on 100 residents of the Mátraháza sanitarium in the fall of 1952, various changes in their normal, submorbid and morbid functions are outlined. The effect of frontal passages on the condition of patients is considered. *Subject Headings:* **1. Medical climatology 2. Health resorts 3. Mátra Mountains, Hungary.**—*G.T.*

6.7–327 551.586:697

Physiological aspects of the heating and ventilation of houses in Britain. *Nature*, London, 174(4430):577–578, Sept. 25, **1954. DWB**—Account of discussion at the British Association, Sept. 2, 1954. T. BEDFORD surveyed recent studies of thermal comfort and the assessment of environmental warmth. G. P. CROWDEN outlined the climatic factors of body temperature and comfort and discussed the British Standards Institution code of practice. J. R. BROWN described experiments on working conditions in the home, for women washing clothes by hand. A. PARKER spoke on house heating and atmospheric pollution, and J. B. DICK on factors of design and construction affecting heating and ventilation in buildings. *Subject Headings:* **1. Environmental control 2. Heating and ventilation. I. Bedford, T. II. Crowden, G. P. III. Brown, J. R. IV. Parker, A. V. Dick, J. B.**—*C.E.P.B.*

ENVIRONMENTAL INFLUENCES

See also: **Aerology** (Kalinovskii), 6.7–10; **Insolation** (Wagner, Dinger), 6.7–197; **Condensation nuclei** (Zenker), 6.7–253; **Relief and precip.** (Buchinskii), 6.7–272; **Climate of Nagano City** (Asakawa), 6.7–300.

6.7–328 551.588.1

Fobes, Charles B. (*U. S. Weather Bureau, Portland, Maine*), **Continentality in New England.** *American Meteorological Society, Bulletin*, 35(5):197–207, May **1954.** 2 figs., ref. **MH-BH**—V. CONRAD's modified continentality formula is applied to New England and isolines of continentality are shown on a map. *Subject Headings:* **1. Continentality 2. New England.** —*I.L.D.*

6.7–329 551.588.6(82):551.577.34

Schwerdtfeger, Werner, **Betrachtungen über eine Klima-änderung in Argentinien.** [Considerations on a climatic change in Argentina.] *Meteorologische Rundschau*, 8(1/2):7–10, Jan./Feb. **1955.** fig., 8 refs. English summary p. 7. **MH-BH**—Annual rainfall in Rosario has increased from 825 mm in 1891–1910 to 995 mm in 1931–50, and decreased in the west and south. This partly due to a change of continentality shown by an increase of the annual range of temperature in the NE and a decrease in the W, resulting from a strengthening of the meridional component of the circulation. It is however partly due to an increase of the cultivated area from 5.4 to 17.4 million hectares. This has decreased the runoff and increased the humidity. *Subject Headings:* **1. Rainfall trends 2. Climatic changes 3. Rosario, Argentina.**—*C.E.P.B.*

MISCELLANEOUS

SOLAR INFLUENCES

6.7–330 551.590.21:551.577

Gillette, Halbert P., **Evidence of a precipitation and sunspot cycle of one month.** *American Meteorological Society, Bulletin*, 35(8):374–376, Oct. **1954.** fig., table. **MH-BH**—An analysis of daily sunspot numbers covering 30 years (1889–1938) shows that both the largest average and highest peak occur on July 12; this agrees reasonably with the dates of the centers of most of BUCHAN's spells of cold periods. Between Jan. 9 and 13, a minimum number of daily sunspots occurs so that a 12-month cycle is evident. Precipitation records from 30 stations (Northeastern states) show a monthly cycle with a secondary peak about 15 days after the main peak. It is inferred from the sunspot numbers "that the earth crosses the center of a very dense stream of solar ions at heliocentral longitude 290° and that magnetism induced in the earth and its concentric ionosphere shells causes reactive effects on the sun." Similar sunspot effects are also produced by the planets. Like sunspot cycles, giant planets are correlated with precipitation cycles. *Subject Headings:* **1. Sunspot effects on rainfall 2. Sunspot cycles 3. Precipitation cycles.**—*I.L.D.*

6.7–331 551.590.21:523.74

Miller, William A., **Intensity variation in sunspots.** *Nature*, London, 175(4456):557–558, March 26, **1955.** photo. **DWB**—Cine-photos of a sunspot on Aug. 11, 1954, show brightening of the penumbra adjacent to the umbra. *Subject Heading:* **1. Sunspots.**—*C.E.P.B.*

6.7–332 551.590.24:551.594.13:550.371

Cornell Aeronautical Laboratory, Inc., Buffalo, N. Y., **Study of the earth's electrical field.** Contract AF 19(122)-467, 13th Quarterly Report, May–July 1954, pub. Sept. 20, **1954.** 6 p. **MH-BH**—The purpose of this project is to investigate the earth's electric field and atmospheric electrical conductivity, and to correlate these quantities with meteorological parameters. During the period June 21, 1954 to July 2, 1954, the recording instruments at the project field station were operated in order to obtain data before, during, and after the solar eclipse of June 30, 1954, which was approximately 83% total in Buffalo. The field and conductivity records did not reveal any significant deviations from normal fluctuations and average values. A substantial cloud cover obscured the sun during most of the eclipse. Data analysis continued for the records of 1953–1954. The analysis is still in progress. *Subject Headings:* **1. Geoelectric field 2. Electrical conductivity of air 3. Solar eclipse, June 1954. I. Garber, David H.**—*Author's abstract.*

OPTICAL PHENOMENA

6.7–333 551.593

Danjon, André, **Quelques phénomènes d'optique atmosphérique.** [Some phenomena of atmospheric optics.] *L'Astronomie*, Paris, 68:329–333, 367–372, 417–421, Sept., Oct., Nov. **1954.** figs. **DWB, DLC**—In this series of three articles written especially for students, the physics of rainbows, supernumerary bows, halos, parhelia, parhelic circles, paranthelia, circumzenithal arcs and coronas are explained. Photographs of some of these phenomena (partly taken with wide-angle lenses) are presented. *Subject Heading:* **1. Optical phenomena.** —*G.T.*

6.7–334 551.593.1

Abnormal refraction. *Indian Journal of Meteorology and Geophysics*, 5(2):191, April **1954. MH-BH**—Data on abnormal refraction observed between 1–3 hours after sunset by a vessel in passage from Kuwait-Basra on Sept. 25, 1953. *Subject Headings:* **1. Atmospheric refraction 2. Persian Gulf.**—*I.L.D.*

6.7–335 551.593.51:551.593.11

Weigel, Werner (*Brocken Met. Station, Harz, Germany*), **Luftspiegelung der untergehenden Sonne und Grüner Strahl beobachtet auf dem Brocken am 2. Januar 1954.** [Mirage of the setting sun and green flash observed on the Brocken Jan. 2, 1954.] *Zeitschrift für Meteorologie*, 8(4):126–127, April **1954. MH-BH**—Author reports on green flash observed on the Brocken in connection with superior mirage over a sea of fog at sunset. He also criticizes use of term "Grüner Strahl" (green ray) insisting it should be "Grüner Blink" (green flash), except for the ambiguity caused by use of "Eisblink" for an entirely different concept. Various associated mirage phenomena are described in detail. *Subject Headings:* **1. Green flash 2. Superior mirages 3. Brocken, Harz, Germany.**—*M.R.*

ELECTRICAL PHENOMENA

See also: **Atmos. electr. data** (Schilling, Childress), 6.7–14; **Ball lightning** (Aniol), 6.7–67; **Ball lightning** (Chirvinskii), 6.7–75; **Sea fog** (Nagamine), 6.7–259; **Earth's electr. field**, 6.7–332.

6.7–336 551.594.1(494)(436)

Israël, H.; Kasemir, H. W. and Wienert, K., **Luftelektrische Tagesgänge und Massenaustausch im Hochgebirge der Alpen. Die luftelektrischen Verhältnisse am Jungfraujoch (3472 m) II; Vergleichsmessungen zwischen Jungfraujoch und Sonnblick.** [Atmospheric-

electric diurnal variations and mass exchange in high Alpine mountains. Atmospheric electric conditions on Jungfraujoch (3472 m), pt. 2; Comparison of Jungfraujoch with Sonnblick.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 8(1/2):72–94, **1955.** 4 figs., 4 tables, 8 refs. German, English and French summaries p. 72–74. **DWB**—Previous investigations (*see* pt. 1, *item* 3.3–250, March 1952, *MAB*) were extended to cover a full year. The systematic variation of conductivity found in summer disappeared in winter. The diurnal variations of potential gradient and air-earth current are parallel, showing that in winter in the high Alps the oceanic type predominates. Good agreement with Sonnblick shows that these results are representative. Dry snow, formed by sublimation only, always carries a positive charge and generates a positive field, but soft hail and granular snow generally carry a negative charge. In summer snow following soft hail or rain indicates a developing thunderstorm. *Subject Headings:* **1. Atmospheric electricity 2. Mountain meteorology 3. Jungfraujoch, Swiss Alps.**—*C.E.P.B.*

6.7–337 551.594.22

Saxe, R. F., **Uniform field breakdown in air.** *Nature*, London, 175(4445):82, Jan. 8, **1955.** 2 refs. **DWB**—As the breakdown voltage in a uniform field gap in air is approached, short relatively high current pulses occur. It is inferred that in addition to the Townsend mechanism a streamer-like mechanism is involved. *Subject Heading:* **1. Electrical discharges.** —*C.E.P.B.*

6.7–338 551.594.222(261)

St. Elmo's fire. North Atlantic Ocean. Indian Ocean. *Marine Observer*, 24(163):10–11, Jan. **1954.** fig. **MH-BH**—March 15, 1953, 49°N, 31°W after a squall, look-out's cap covered by minute balls of white light; March 17, St. Elmo's fire on ship in 5°25′S, 75½°E. *Subject Heading:* **St. Elmo's fire.**—*C.E.P.B.*

6.7–339 551.594.223:779

Dixon, F. E. and Scott, J. R., **Photography and ball lightning.** *Weather*, 10(3):98, March **1955.** fig. **DWB**—A further example of an illusion produced by a photograph of a street lamp. *Subject Heading:* **1. Ball lightning illusion.**—*C.E.P.B.*

6.7–340 551.594.223:778

Poulter, Robert M., **Photography and ball lightning.** *Weather*, 9(4):121, April **1954.** photo, ref. Also: Taylor, J. E., Petersen, Helge and Poulter, Robert M., **Photography and ball lightning.** *Ibid.*, 9(10):321, Oct. **1954. MH-BH**—Photo of lights with hand camera on a night with no lightning, showing how it can simulate ball lightning. Referring to POULTER's note, TAYLOR points out an error. PETERSEN gives further information about the photograph reproduced by POULTER. POULTER replies. *Subject Headings:* **1. Ball lightning 2. Lightning photography.**—*C.E.P.B.*

AURORAS

6.7–341 551.594.5:550.38

Heppner, J. P., **Time sequences and spatial relations in auroral activity during magnetic bays at College, Alaska.** *Journal of Geophysical Research*, 59(3):329–338, Sept. **1954.** 4 figs., 11 refs. **MH-BH**—The auroral activity versus geomagnetic latitude and time at Fairbanks is shown during three simple magnetic disturbances of negative bay type, giving also the disturbance vectors. A close relation was found which suggests that "the auroral forms are not independent of the electromagnetic force responsible for the intense auroral-zone currents," as it is usually assumed (CHAPMAN and others). *Subject Headings:* **1. Auroral observations 2. Auroral-geomagnetic relationships 3. Fairbanks, Alaska.**—*A.A.*

6.7–342 551.594.5

McLaughlin, Dean B. (*Michigan Univ.*), **A note on the motion of auroral streamers.** *Astrophysical Journal*, 120(1):185, July **1954. DWB**—During a display on March 22, 1920 it was noted that the drift was westward in the evening hours and eastward after midnight. *Subject Heading:* **1. Auroral streamer drift.**—*M.R.*

6.7–343 551.594.5

McQuistan, G. W. and Thomson, I. L., **Theory of the determination of auroral heights and locations from photographs.** Wellington, New Zealand. Carter Observatory, Contract AF 19-64(500)-1, Scientific Report No. 1, June 30, **1954.** 8 p. figs., 14 eqs. **MH-BH**—The method described (which is used at Carter Obs., N. Z.) is based on the Norwegian method of CARL STÖRMER, modified for the sake of simplicity without loss in accuracy. The subjects discussed are 1) altazimuth grids for a single station, 2) lens distortion, 3) auroral forms and features in altazimuth coordinates, 4) base-line constants, 5) spherical coordinates with the base-line as axis, 6) finding corresponding points, 7) heights and geographical location of aurora. The methods are described in sufficient detail, with mathematics and diagrams, so as to be readily applicable in practicable calculations of auroral height from 2-station photographs. *Subject Headings:* **1. Auroral height determination 2. Auroral photograph calculations 3. New Zealand. I. Störmer, Carl.**—*M.R.*

6.7–344 551.594.51

Ashburn, Edward V., **Measurements of the specific intensities of the auroral green line at College, Alaska.** *Journal of Atmospheric and Terrestrial Physics*, 6(1):57–60, Jan. **1955.** fig., 2 tables, 3 refs. **DWB**—Measurements of specific intensities (erg/cm² sec sq. deg.) of auroras with a photoelectric recording photometer are described. Frequency distribution of intensities and mean intensities for different zenith distances are tabulated. Intensity ranges up to 3.8×10^{5} for 5577 Å line and increases with zenith distance. *Subject Headings:* **1. Auroral spectra 2. College, Alaska.**—*C.E.P.B.*

ACOUSTICAL PHENOMENA

6.7–345 551.596.1:551.557:551.524.7

†*Kennedy, William B. and Brogan, Lee, **Determination of atmospheric winds and temperature in the 30–60 km region by acoustic means (a study of annual and diurnal variations).** Denver Univ. Denver Research Institute, Contract AF 19(122)-252, Final Report, June 30, **1954.** 97 p. 21 figs., 9 tables, 87 refs., 78 eqs. **DWB**—The annual variation of winds and temperatures in the 30–60 km region (Colorado, July 1950–Aug. 1952) and their diurnal variation (New Mexico, Oct. 20–24, 1952) were investigated by means of acoustic propagation studies with explosive sources. The report includes discussion of the calculations involved, tables and graphs of data obtained, and conclusions reached. Strong westerly winds were found to prevail in winter and weak easterly winds in summer. During daytime the wind force was found to decrease while temperature increased. The report includes discussion of possibilities of acoustic sounding involving non-explosive sources. Abstracts of Scientific Reports 1–4 published under the contract are appended. *Subject Headings:* **1. Acoustical soundings 2. Upper air temperature measurement 3. Upper air wind measurement.**—*G.T.*

PART II. ANNOTATED BIBLIOGRAPHY ON RADAR AS APPLIED TO CLOUD AND PRECIPITATION PHYSICS

By: *Wilhelm Nupen*

EXPLANATORY NOTE

This is the second in a series of four bibliographies on theoretical cloud physics, applications of radar to cloud and precipitation physics, and applications of cloud physics to weather control. These bibliographies will supplement the highly selective annotated bibliography on Cloud Physics and Rain Making which was published in Vol. I, No. 3 (March 1950) of *Meteorological Abstracts and Bibliography*, and, it is hoped, will bring the user up to date on several aspects of this broad subject.

The first bibliography in this series, which was published in *MAB*, Vol. 6, No. 6, June 1955, contained 379 items on general cloud physics, drop size distribution, electrical charges in clouds and rain, etc.

The present bibliography contains 250 items on radar studies of clouds, precipitation and weather. A previous bibliography on Radar Meteorology, appearing in the August 1951 issue of *Meteorological Abstracts and Bibliography*, contained over 200 abstracts of articles on radar as applied to the study of storms, clouds, rain, snow, etc. These items are not repeated in this bibliography, but reference is made to the subject matter of each pertinent article in the following classified subject outline. Articles appearing in the *current* bibliography will be found after each subject with the letters 6G– as a guide. Those in the earlier bibliography are entered in brackets with the reference 2H– as a clue; (2H–165), for instance.

The entries are arranged chronologically and alphabetically by author within each individual year. It will be seen that a number of early studies (1942–48) which had previously been held confidential, have now been "declassified" and are included for the first time in the open literature. These are mainly of historical value, since the facts have usually been confirmed or included in subsequent unrestricted literature.

The following subject outline is intended as an aid in finding material on specific aspects of the problem. It will not necessarily reveal all of the literature on the subject, but should quickly give the investigator who is unfamiliar with the literature a few "points of reference," which will in turn lead him to further material on the subject.

OUTLINE OF CONTENTS

SUBJECT OUTLINE

General
Conferences and meetings, 6G–9, –36, –55, –68, –78, –81, –103, –115, –131, –217, –223, –229, –258
Manuals, 6G–74 (2H–17, –94, –121, –141, –218)
Textbooks, 6G–79
Bibliographies, 6G–57, –63, –141, –212 (2H–47, –49, –187)
History, 6G–51, –180, –197, –203, –212, –216, –221 (2H–21, –55)
Definitions, 6G–51, –79, –203, –211, –224 (2H–54, –203)
Research, 6G–15, –26, –27, –29, –37, –38, –43, –45, –47, –52 to –56, –61, –63, –64, –78, –81, –83, –85, –88, –91, –93, 95, –98, –100, –105, –117, –119, –120, –126, –130, –132, –133, –136, –137, –148, –149, –163, –168, –182, –194, –200, –219, –225, –229, –239, –243, –257, –264

THEORETICAL AND PHYSICAL RESEARCH

Air masses and Fronts
Fronts, 6G–2, –7, –30, –32, –34, –42, –88, –105, –128, –134, –146, –157, –160, –163, –181, –205 (2H–18, –25, –33, –45, –91, –92, –96, –112, –142, –179, –189, –191)
Vertical motion measurements, 6G–7, –13, –19, –23, –28, –32, –34, –36, –42, –59, –109, –127, –146, –160, –164, –194, –204, –207, –217
Bénard Convection Cells, 6G–73, –82, –110
Inversions, 6G–73, –102, –113, –114 (2H–43, –190)
Ducts, 6G–127

Cloud structure, 6G–1, –13, –19, –25, –41, –51, –56, –58, –59, –64, –65, –68, –73, –82, –85, –88, –89, –95, –99, –100, –109 to –111, –116, –120, –122, –124, –127, –129, –130, –132 to –134, –143, –146, –147, –153, –156, –157, –159 to –167, –169, –170, –172, –173, –175, –177 to –180, –182, –190 to –192, –194, –196 to –200, –202, –204 to –206, –207, –208, –210, –211, –217, –218, –219, –223, –232, –234, –236, –254, –261
Cumuliform, 6G–19, –23, –31, –37, –38, –43, –132, –143, –159, –164, –173, –175, –177, –178, –190, –194, –239, –261
Stratiform, 6G–4, –23, –36, –99, –101, –132, –143, –159, –173, –175, –177, –181, –194, –214, –218
Convective, 6G–37, –110, –143, –159, –164, –173, –175, –177, –194, –235, –240
Liquid water content, 6G–13, –23, –25, –33, –34, –37, –58, –64, –94, –104, –130, –173, –202, –206, –207, –219, –235, –236, –254
Hydrometeors, 6G–1, –37, –38, –43, –47, –49, –53, –54, –58, –60 to –62, –64, –70, –82, –86 to –88, –90 to –92, –94, –99, –100, –104, –105, –110, –117, –121, –134, –135, –166, –169 to –173, –175, –178 to –181, –190, –192, –194, –202, –204, –207, –210, –218, –241, –247, –249
Ice particles, 6G–43, –58, –65, –87, –91, –94, –99, –148, –166, –178 to –181, –210, –232, –241, –247, –249, –267
Snow particles, 6G–90, –91, –99, –148, –220
Liquid water particles, 6G–24, –64, –87, –91, –99, –104, –148, –169, –179, –180, –207, –247, –254
Cloud seeding, –37, –38, –55, –56, –130, –133, –173, –240
Fog, 6G–10, –98, –117, –148
Precipitation
Precipitation patterns, 6G–30, –36, –37, –51, –59, –74, –108, –154, –156, –157, –160, –181 –237
Precipitation measurements, 6G–25, –40, –118, –125, –128, –130, –139, –140, –147, –148, –154 to –156, –162, –167, –170, –171, –174
Showers, 6G–4
Rain, 6G–1, –2, –4, –7, –20, –29, –31, –35 to –37, –40, –41, –52, –80, –90, –91, –94, –95, –98 to –100, –111, –112, –116, –118, –119, –122, –125, –126, –128, –130, –134, –139, –140, –147, –148, –154 to –157, –160, –162, –167, –170 to –177, –179, –180, –191, –201, –204, –234, –236
Rainfall distribution, 6G–28, –118, –119, –146, –155
Rainfall intensity, 6G–52, –61, –154, –155, –162, –167, –171, –179, –233, –248
Rainfall velocity, 6G–24, –89, –90, –162, –179, –181
Rainfall amount, 6G–40, –71, –80, –118, –119, –125, –128, –139, –140, –147, –154, –155, –167, –174, –233, –260
Raindrop formation, 6G–35, –41, –43, –52, –70, –87, –89 to –91, –95, –100, –101, –156, –170, –175, –191, –194, –213
Raindrop size distribution, 6G–19, –24, –29, –32, –37, –42, –52, –100, –104, –112, –119, –130, –179, –180, –194, –204, –231, –232, –248
Raindrop velocity, 6G–42, –70, –194
Raindrop reflectivity, 6G–1, –6, –20, –26, –28, –29, –31, –34, –36, –47, –48, –107, –112, –117, –130, –134, –148, –169, –172, –176, –180, –191, –192, –232, –246, –247, –248
Snowfall distribution, 6G–18, –54
Snowfall velocity, 6G–90
Analysis of snow, 6G–29
Snow flakes reflectivity, 6G–4, –18, –20, –47, –49, –54, –60, –85, –107, –135, –145, –148, –175, –176, –178 to –181, –191, –220
Snow particles, 6G–4, –18, –20, –94, –134, –135, –175, –176, –179, –180, –191, –194
Hail, 6G–1, –75, –166, –178, –183, –228, –267
Bright band, 6G–4, –36, –59, –60, –65, –66, –71, –86, –87, –91, –116, –148, –150, –180, –191, –194, –218, –223, –238, –249
Upper band, 6G–89, –116, –150, –180, –194, –213, –214
Spheroid reflectivity, 6G–29, –36, –47, –48, –52, –56, –86, –87, –91, –98, –166, –169, –180, –194, –213, –214, –247
Ellipsoid reflectivity, 6G–60, –87, –91, –180, –194, –213, –214, –247
Winds
Wind measurements, 6G–27, –37, –50, –111
Wind correlation measurements, 6G–7, –37, –135, –179, –181, –194, –195, –205, –218
Cyclones, 6G–70, –207, –241
Turbulence, 6G–3, –15 to –17, –19, –21 to –23, –46, –72, –75, –93, –95, –103, –121, –161, –164, –165, –178, –182, –190, –208, –222, –223, –228, –229, –251, –263
Line squall, 6G–157, –205, –208, –237, –242, –252
Sand and dust storms, 6G–1
Hurricanes, 6G–14, –26, –45, –51, –77, –83, –108, –111, –129, –136, –163, –165, –187, –205, –229, –264
Tornadoes, 6G–123, –131, –136, –137, –142, –149, –153, –163, –165, –172, –185, –188, –198, –199, –227, –229, –242, –257, –262
Tornado research, 6G–131, –136, –137, –142, –149, –163, –165, –172, –185, –188, –198, –199, –215, –227, –229
Typhoons, 6G–30, –51, –264
Thunderstorms, 6G–8, –14, –21, –26, –27, –31, –34, –51, –59, –94, –100, –103, –124, –128, –138, –140, –141, –149, –161, –163, –166, –172, –173, –178, –199, –202, –208, –223, –228, –267
Thunderstorm research, 6G–15, –27, –31, –51, –52, –78, –103, –110, –124, –141, –149, –157, –161, –165, –166, –172 to –174, –178, –182, –183, –189, –199, –202, –216, –223, –227, –228
Lightning, 6G–124, –141, –189
Flash Floods, 6G–196

Radar Echoes

Atmosphere
Troposphere, 6G–1, –39, –69, –72, –97, –158, –197
Ionosphere, 6G–114, –197
Clouds, 6G–1, –6, –22, –23, –29, –30, –32, –33, –36 to –41, –43, –44, –47, –52, –56, –58, –59, –64, –65, –71, –73, –75, –76, –79, –82, –85 to –88, –93 to –96, –98 to –100, –104, –105, –108 to –110, –122, –124, –130, –132, –134, –143, –145, –148, –150, –153, –156, –157, –159 to –161, –164, –165, –167, –169, –172, –173, –175, –177, –178, –180, –182, –189 to –191, –194, –196 to –199, –202, –205, –206, –207, –211, –212, –223, –230, –236, –243, –244, –254, –255, –256, –261 (2H–25, –51, –66, –69, –84, –90, –102, –111, –116, –122, –131, –134, –149, –158, –170, –178, –183, –192, –196, –226)
Cumuliform echoes, 6G–1, –7, –19, –23, –30, –38, –43, –75, –124, –132, –143, –159, –164, –173, –177, –189, –190, –194, –239, –251, –253
Stratiform echoes, 6G–23, –36, –73, –99, –101, –114, –132, –143, –159, –173, –177, –178, –194, –214, –218, –253, –255, –256
Convective echoes, 6G–15, –36 to –38, –82, –110, –143, –159, –164, –173, –177, –194
Cloudless regions, 6G–39, –97
Precipitation, 6G–1, –13, –19, –22, –25 to –34, –36 to –38, –40 to –44, –47, –49 to –56, –58, –59, –61, –62, –70, –71, –75, –80, –85 to –91, –94, –95, –98 to –101, –103, –107, –109, –112, –116, –117, –119, –120, –125, –126, –133 to –135, –139, –140, –146 to –148, –150, –154 to –157, –160 to –162, –165 to –167, –170 to –175, –177 to –183, –186, –191, –194, to –197, –200, –204 to –206, –212 to –214, –218, –219, –230, –239, –241, –247, –248, –255, –256, –266 (2H–15, –22, –33, –35, –62, –69, –71, –79, –83, –84, –86, –90, –91, –97, –99, –101, –102, –105, –110, –112, –114, –126, –135, –142, –145, –146, –151, –154, –161, –163, –165, –169, –180, –196, –206, –209, –210, –215, –217, –219 to –221, –232)
Showers, 6G–13, –28, –30, –42, –88, –109, –116, –146, –148, –162, –248
Rainfall, 6G–1, –20, –24 to –26, –28 to –33, –36, –37, –44, –50, –80, –85, –88, –90, –100, –112, –116 to –119, –125, –126, –130, –134, –139, –140, –146 to –148, –154 to –157, –160 to –162, –167, –170 to –174, –176, –177, –179, –180, –191, –197, –201, –204, –212, –246, –252, –260, –266, (2H–15, –22, –33, –35, –45, –51, –62, –64, –74, –81, –83, –87, –95, –96, –101, –114, –120, –124, –131, –146, –150, –156, –164, –175, –176, –180, –188, –191, –201, –202, –207, –209, –210, –213, –215, –217, –219, –220, –228, –230, –232)
Raindrops, 6G–34, –42, –43, –47, –52, –53, –58, –61, –70, –90, –91, –95, –100, –107, –112, –119, –156, –162, –167, –169, –173, –180, –194, –204, –206, –231, –236, –249, –254
Bright band, 6G–4, –36, –42, –43, –59, –60, –65, –71, –85, –86, –87, –89, –90, –91, –116, –134, –148, –150, –180, –194, –213, –214, –218, –223, –238 (2H–69, –71, –126, –149, –155, –161, –162, –175, –188, –204, –206, –213)
Upper band, 6G–89, –116, –134, –150, –180, –194, –223
Theory, 6G–101, –194
Hydrometeors, 6G–24, –29, –34, –61, –64, –70, –88, –90 to –93, –95, –97, –100, –101, –104, –105, –109, –110, –117, –121, –134, –135, –150, –169, –170, –172, –173, –175, –176, –178 to –181, –183, –190 to –192, –194, –197, –202, –206, –207, –210 to –214, –218 to –220, –249 (2H–69, –79, –112, –135, –142, –174
Spheroids, 6G–48, –56, –87, –90, –91, –98, –166, –180, –210, –213, –247
Ellipsoids, 6G–60, –65, –87, –91, –106, –180, –213, –247
Snow, 6G–18, –20, –29, –49, –54, –75, –85, –90, –135, –145, –175, –176, –178 to –181, –247 (2H–35, –74, –97, –155, –161, –176, –206, –215)
Snow crystals, 6G–18, –91, –99, –175, –176, –179, –180, –181, –191, –206, –220
Snow flakes, 6G–18, –20, –47, –49, –54, –60, –91, –99, –106, –134, –135, –148, –175, –176, –178 to –181
Ice, 6G–43, –56, –65, –86, –90, –91, –94, –99, –166, –191, –210, –213, –249 (2H–69, –162, –175, –179, –206)
Ice needles, 6G–36
Hail, 6G–1, –65, –148, –166, –173, –178, –183, –228
Thunderstorms, 6G–5, –8, –20, –21, –26, –27, –30, –31, –34, –42, –51, –52, –78, –79, –88, –94, –100, –103, –116, –124, –128, –138, –140, –141, –163, –165, –174, –182, –183, –197, –199, –202, –205, –212, –215, –227, –228, –267 (2H–10, –13 to –15, –18, –23, –28, –30, –32, –33, –35, –37, –45, –56 to –58, –60, –70, –75, –88, –96, –99 to –102, –105, –108, –126, –128, –129, –139, –152, –158, –159, –174, –181, –183, –184, –188, –189, –205, –210)
Line squall, 6G–88, –157, –172, –205
Lightning, 6G–75, –78, –88, –124, –134, –138, –141, –189, –212, –226
Sea, 6G–105, –113, –144
Cyclones, 6G–34, –116, –207, –241
Hurricanes, 6G–26, –45, –77, –83, –88, –129, –136, –163, –165, –187, –205, –229, –264 (2H–45, –58, –90, –96, –138, –168, –193, –229)
Tornadoes, 6G–123, –131, –136, –137, –153, –163, –165, –172, –183, –185, –188, –198, –199, –215, –227, –229, –242, –257, –262
Typhoons, 6G–30

Applications

Precipitation Detection, 6G–2, –3, –5, –13, –17, –25 to –30, –32, –33, –36 to –38, –40 to –44, –46, –50 to –53, –55, –58, –61 to –63, –65, –71, –74, –80, –81, –84, –86 to –92, –95, –99 to –101, –103, –104, –107, –111, –112, –116 to –120, –122, –125, –126, –128, –132, –134 to –136, –139, –140, –146, –149, –150, –154 to –157, –160, –161, –167 to –180, –182, –184, –186, –187, –191, –194 to –196, –200, –201, –204, –206, –207, –213, –214, –216, –217, –218, –219, –250

Storm Detection, 6G–2, –5, –8, –15 to –17, –20 to –27, –30 to –32, –34, –42, –45, –49 to –54, –56, –59, –63, –71, –72, –74, –75, –77 to –79, –81, –83 to –85, –87 to –89, –93 to –95, –100, –103, –107 to –111, –122 to –124, –128, –136 to –138, –141 to –143, –146, –148 to –151, –153, –157, –160, –161, –163 to –166, –168, –169, –172 to –174, –178, –182 to –186, –188 to –192, –194 to –200, –202, –205, –206, –207, –208, –209, –211 to –213, –215, –216, –217, –223, –224, –225, –228, –229, –242, –253, –263, –264, –265, –267

Forecasting and Warning, 6G–3, –12, –34, –45, –46, –51, –53, –72, –74, –75, –81, –83, –93, –131, –137, –142, –143, –151, –157, –160, –161, –163, –182, –196 to –198, –205, –257, –259, –264, –265

Disaster warning, 6G–45, –131, –163, –196, –198

Forest fire protection, 6G–149

Hail prevention, 6G–149

Turbulence, 6G–182, –190, –208, –222, –223, –228, –229, –251, –263

Flight planning (in-flight), 6G–3, –15 to –17, –19, –21 to –23, –46, –72, –75, –81, –93, –103, –122, –151, –161, –164, –169, –178, –208, –222, –223, –228, –251, –263

Military applications, 6G–2, –77, –122, –196, –225, –259

Networks, 6G–3, –12, –63, –119, –131, –137, –142, –149, –151, –163, –174, –197 to –199, –217, –225, –229, –242, –257, –262

Projects, 6G–15, –26, –29, –45, –61, –63, –83, –110, –137, –142, –149, –163, –168, –200, –217, –229, –242, –262

Cloud seeding, 6G–37, –38, –55, –130, –133, –173, –240

Instruments and Equipment

Air-borne, 6G–16, –22, –25, –37, –41, –43, –44, –46, –58, –75, –80, –84, –93, –103, –155, –156, –161, –178, –182, –183, –208, –223, –228

AN/APQ-13, 6G–5, –201

AN/APS-2F, 6G–88, –130 (2H–87)

AN/CPN-6, 6G–42

AN/CPS-9, 6G–74, –146, –168

APQ-13, 6G–71

APQ-15, 6G–71

APS-2, 6G–131, –149

APS-15A, 6G–80, –118, –119, –153

Balloons, 6G–37

Bendix radar, 6G–208

Black box, 6G–121, –229

Circularly polarized radar, 6G–186

Cloud detectors, 6G–243

Cloud droplet impinger, 6G–64

CPS-9, 6G–167 (2H–145)

Decca radar, type 41, 6G–209

Direction finder, 6G–78

Disdrometer, 6G–25, –84

E. K. Cole cloud warning radar equipment, 6G–22

L-Band equipment, 6G–102 (2H–149)

MEW (Microwave early warning), 6G–2

MHF (Microwave height finding), 6G–4, –13, –20

Miscellaneous devices, 6G–76, –81, –84, –187, –193, –200

Pulse integrator, 6G–51, –167, –233

Radar-rainfall area integrator, 6C–118, –119

Radar-camera, 6G–226

Raindrop camera, 6G–119

Radar cloud base and top indicators, 6G–243

Rain-rate gage, 6G–136

RASAPH (Radar signal spectrograph), 6G–51, –72 (2H–135, –203)

S-Band search radar, 6G–110 (2H–149)

SCR-584, 6G–5 (2H–39, –57, –129, –135, –145, –146, –170, –184, –196, –197, –205)

SCR-615B, 6G–61, (2H–39, –57, –129, –135, –145, –146, –170, –184, –196, –197, –205)

"Sir Echo" (Radar-weather-mapping installations), 6G–182, –222

Spherics incidence azimuth integrator, 6G–188

TPL-1, 6G–80, –119

TPS-10, 6G–119 (2H–65, –145)

Tornadometer, 6G–229

Transmissometers, 6G–224

Turbulence meter, 6G–200

Variographs, 6G–242

Water collectors, 6G–58

Watson-Watt's oscilloscope, 6G–78

584, 6G–71

775-BS rain gage, 6G–80

Geographical Outline

Africa

South Africa, 6G–27

Southern Rhodesia, 6G–214

Uganda

Entebbe Airport, 6G–143

Asia

India

Dum Dum Airport, 6G–209

Japan, 6G–239

Malaya, 6G–22, –178
Singapore, 6G–75
Philippine Islands, 6G–252
AUSTRALIA, 6G–12
New South Wales
Sydney, 6G–36, –116, –156
EUROPE
England, 6G–176, –177, –190
Bedfordshire, 6G–82, –189
Cambridge, 6G–65, –66, –109, –114
Malvern, 6G–65
Southeast England, 6G–44
France
Magny-les-Hameaux, 6G–89
Trapes, 6G–50
Monaco, 6G–39, –96, –113
Netherlands, 6G–177
NORTH AMERICA
Canada, 6G–3, –4
Ontario
Clinton, 6G–20
Ottawa, 6G–2, –18, –20, –54
Scarboro, 6G–127
Quebec
Dorval, 6G–7
Montreal, 6G–175, –181
United States, 6G–149, –228
Florida, 6G–15, –26
Jacksonville, 6G–129
Illinois, 6G–80, –119, –155, –240
Champaign, 6G–227
Goose Creek, 6G–139, –154, –265
Urbana, 6G–153, –185
Kansas, 6G–188
Massachusetts, 6G–254, –266
Boston, 6G–74, –237
Buzzards Bay, 6G–117
Cambridge, 6G–23, –73
New Bedford, 6G–105
New England, 6G–32, –132, –207
New Jersey
Belmar, 6G–146
New Mexico, 6G–38, –94, –240
North Atlantic States, 6G–157
Ohio, 6G–94, –110, –240
Wilmington, 6G–40
Oklahoma, 6G–188
Texas, 6G–123, –131, –163, –198, –242, –257
Austin, 6G–115
Washington, D. C., 6G–46
Panama, 6G–208
Puerto Rico, 6G–239
OCEANS, SEAS AND ISLANDS
Atlantic Ocean
North Atlantic Ocean, 6G–108, –144
Mediterranean, 6G–39
Pacific Ocean
Hawaiian Islands, 6G–112, –130
Sumatra, 6G–22
Red Sea, 6G–67

1941

6G–1 551.501.81

*Ryde, J. W., **Echo intensities and attenuation due to clouds, rain, hail, sand and duststorms at centimetre wavelengths.** *General Electric Co., Ltd. Research Laboratories, Wembley, England, Report,* No. 7831, Oct. 13, **1941.** 39 p. 9 figs., 6+tables, 53 eqs. **DWB**—The ratio of echo intensities for different wave lengths from 100 cm down to 1 cm, including attenuation for point to point transmission are computed in detail, based on G. MIE's theory. Expressions for the absolute echo intensity and the ratio of same from an aircraft within rain or cloud are determined. The scattering functions, determined for a single drop are given in ten coefficients treated individually for the particular wavelengths considered. The results are presented in tables and graphs, the latter featuring any wavelength at which the echo intensity from cloud and aircraft is equal or their proportions. *Subject Headings:* **1. Radar wave attenuation 2. Radar reflections from weather.**—*W.N.*

1944

6G–2 551.577:551.501.81

*Marshall, J. S., **Summer storm echoes on radar M.E.W.** *Canada. Army Operational Research Group, Report,* No. 18, Nov. **27, 1944.** 23 p. figs., tables, eqs. **DWB**—An early attempt (summer 1944) to correlate radar (10.7 cm) echoes obtained at Ottawa with rain in a range of 90 mi, and vice versa. The only 3 regular weather stations were 88–92 mi apart. Most of the precipitation information was obtained from cooperative observers or special observers who were called by phone when an echo was observed. It was found that although echoes occurred in connection with cold fronts, there were no cases of echoes without rain and little correlation with intensity of rain except that light rain was not detected at 90 mi. However 57 cases of rain occurred outside of an echo. These occurred usually outside the trailing edge of an echo (70% probability), the side edge (50%) and only 20% chance outside the leading edge. Correlations show that leading edge of echo usually is ahead of leading edge of rain by 3 mi or so. Although only a small fraction of the total hours of rainfall in a 50 mi radius were detected by radar, a large fraction (83% within 20 mi and 62% within 50 mi) of the total quantity of rainfall was detected. Other correlations, theory and application

in forecasting, tracking storm areas and in military or air operations are analyzed. Usefulness of Microwave Early Warning (MEW) sets and height finding sets are compared. *Subject Headings:* **1. Radar rain observation data 2. Stormy weather group 3. Ottawa, Canada. I. Canada. Army Operational Research Group.**—*M.R.*

1945

6G–3 551.509.1:551.501.81

Canada. Army Operational Research Group, **Radar weather messages and their use.** Its *Report*, No. 40, Nov. 19, **1945.** 7 p. 7 figs., numerous tables, 5 refs. **DWB.** Also: *Idem*, **Transmission of radar weather echoes.** Its *Memorandum*, No. 25, Aug. 27, **1945.** 24 p. tables. **DWB**—The Canadian radar network (3 stations) and radar precipitation detection methods are outlined, a code of transmission of such information presented and a detailed forecasters' log given to show the type and distribution of information to pilots in each case from Aug. 25 to Sept. 21, 1945, and the use made of the information in avoiding storms, of speeding up flights or in improving forecasts. Results generally favorable to continuation of dissemination of information over teletype. The second report gives details of radar precipitation network and its operation, and methods of coding as well as code specifications and instructions for transmission of PPI data from Canadian radar stations. Errors in coding and decoding are analyzed. *Subject Headings:* **1. Radar weather message code 2. Radar precipitation information uses 3. Radar weather transmission 4. Stormy Weather Group 5. Canada.**—*M.R.*

6G–4 551.501.81:551.577

Marshall, J. S. and Tibbles, L. G., **Analysis of storm echoes in height using M.H.F.** *Canada. Army Operational Research Group, Report*, No. 30, June 25, 1945. 10 p. figs. (some photostats). **DWB.** Also: Eon, L. G., **Investigations of the "bright band" discussed in CAORG Report, No. 30.** *Ibid.*, No. 42, Nov. 16, **1945.** 2 p. **DWB**—A thorough synoptic and statistical analysis of numerous cases of radar storm height observations using MHF (Microwave Height Finding) equipment having a fixed azimuth vertical sweep from $-3°$ to $+30°$ elevation. Great horizontal variation in intensity of returns and similar vertical uniformity (except for wind shear effects) were noted in instability showers, but with frontal rain a <1000′ thick horizontal layer, 2000′–4000′ below freezing level was usually noted. The second report consists of a study of the bright band noted in the previous report. It was found to occur just below (with a top edge) at the freezing level, and to be caused by snow crystals in the process of melting causing increased scattering. The snow flake which is melting is thought to be coated with a film of water which makes it act like a raindrop although with greatly enhanced size. Radio communication with the observation plane was impossible when it was flying through the bright band, though it was very good below the band. Snow was noted above the band and rain below. This is the first mention of the bright band. *Subject Headings:* **1. Radar precipitation height finding 2. MHF radar equipment 3. Bright band echoes. I. Canada. Army Operational Research Group.**—*M.R.*

6G–5 551.501.81

Swingle, Donald M. and Wexler, Raymond, **Preliminary report on optimum wavelength for storm detection.** *U. S. Evans Signal Laboratory, Belmar, N. J., Technical Memorandum*, No. 183-R, Nov. 7, **1945.** 5 p. 3 figs., 3 tables, 6 refs., eqs. Photostat of typescript. **DWB**—The theoretical power received from a model thunderstorm by an assumed radar is computed as a function of range and wavelength. Attenuation due to oxygen and water vapor in a tropical atmosphere is assumed. In addition, attenuation due to heavy rain is considered. In a tropical atmosphere, the optimum wavelength for maximum power received is computed to lie near 2.0 cm. With attenuation due to 6 or 12 km of heavy rain, the optimum wavelength for maximum power received is generally shifted to near 2.5 cm. The theory is applied to compute the performance of radar sets AN/APQ-13 and SCR-584. The theoretical performance agrees well with the known performance of the two sets. *Subject Headings:* **1. Radar performance 2. Radar storm detection 3. Atmospheric attenuation theory.**—*Authors' abstract.*

1946

6G–6 551.501.81

Ryde, J. W., **Attenuation of centimetre radio waves and the echo intensities resulting from atmospheric phenomena.** *Institution of Electrical Engineers, London, Journal, Pt. 3A*, 93(1):101–103, **1946.** 3 tables. **DLC**—Theoretical attenuation of 1 to 10 cm radar waves assuming constant temperature, drop size and concentration expressed in loss in decibel power per unit length of path, is worked out for atmospheric oxygen, nitrogen and water vapor, for fine drops (cloud and rain <0.2 cm), for large rain drops (0.01 cm to 0.6 cm), and for hail. It is shown that attenuation is not serious for 3 to 10 cm waves when gases or water vapor are present. For small drops or clouds

it is only serious for long paths or short wave length. For large drops it can be very serious, especially when rainfall rates of 40 to 100 mm/hr occur, as in thunderstorms. Quantitative values are worked out for small drops in terms of visual range assuming $T=0°C$. Values of K are given for rain when $T=18°C$ for $\lambda=1$ to 10 cm. *Subject Headings:* **1. Radar wave attenuation 2. Radar reflections from weather.**—*M.R.*

1947

6G–7 551.501.81:551.577

§Hare F. Kenneth, **Movement of precipitation areas.** *Canada. Army Operational Research Group, Report*, No. 48, Dec. 5, **1947.** 27 p. 11 figs., 3 tables, 5 refs. **DWB**—In this report 5 cases of movement of rain areas associated with conditions of vertical wind shear between May 28 and Sept. 30, 1946 were investigated by means of synoptic, aerological and radar analysis to see if the theory that rain areas move in accord with wind direction and speed at the freezing level (Bergeron-Findeisen theory) is valid. In 3 cases (CuNb clouds) the agreement was almost perfect. In case of warm front *Ast* clouds the echoes moved with the wind at 7500 ft, or 5000 ft below freezing level and in one case there was no agreement whatever. *Subject Headings:* **1. Radar precipitation movement studies 2. Cloud movement 3. Stormy Weather Group 4. MEW radar 5. Dorval, Quebec. I. Canada. Army Operational Research Group.**—*M.R.*

6G–8 551.501.83:551.515.4 551.501.83:551.590.21

Khastgir, S. R.; Das Gupta, M. K. and Ganguli, D. K., **Location of thunderstorm from directional observations of atmospherics during sunrise and sunset.** *Nature*, London, 159(4043):572–573, April 26, **1947.** fig., table, 8 refs. Also their: **Some directional observations of atmospherics on 1000 meters during sunset time.** *Indian Journal of Physics*, Calcutta, 21:169–180, Aug. **1947. DLC**—1) A method to estimate difference between longitude of source and receiver is discussed. (*Same item as* 2H–75, Aug. 1951, *MAB.*) 2) A method is developed to locate the center of a thunderstorm that gives rise to sferics. Results of directional observations of sferics (sunrise and sunset), May–June 1946, are presented. (*Same item as* 4K–192, Nov. 1953, *MAB.*) *Subject Headings:* **1. Radar storm detection 2. Sferics thunderstorm location 3. Twilight effects on sferics.**—*W.N.*

6G–9 551.501.81:06

Massachusetts Institute of Technology, **Minutes of the Weather Radar Conference, March 14, 1947.** June 16, **1947.** 20 p. 7 figs. Mimeo. **DWB**—This first Weather Radar Conference was attended by 91 persons (listed alphabetically, with addresses). No prepared papers were delivered. However some interesting notes made at the conferences are here reproduced in mimeograph. *Subject Headings:* **1. Weather Radar Conference, M.I.T., 1947 2. Radar conferences. I. Weather Radar Conference, M.I.T., 1947.**—*W.N.*

6G–10 551.510.81:621.396.826

Radar, wind and weather. *Air-Sea Safety*, Wash., D. C., 2(3):24–26, March **1947.** photos. **DWB**—Reflection from ocean waves in a rough sea decreases the efficiency of radar on ships, but radar's success in locating obstructions (ships, ice, shore) and usefulness for navigation in fog more than prove its worth. Reflections from waves should not be confused with those from meteorological elements. *Subject Heading:* **1. Radar reflections from waves.**—*M. P. Kramer.*

6G–11 551.501.8

Rubčić, Edo E., **Radar u meteorologiji.** [Radar in meteorology.] *Split, Yugoslavia. Hidrografski Institut Mornarice. Meteorološki Otsjek, Vremenske Prilike*, 2(7/9):17–23, Nov. **1947.** 18 diagrs. **DWB**—General technical description of radar with diagrams showing parts and explaining principle of operation. Meteorological applications of radar are discussed. Radar screen pictures of various meteorological phenomena (precipitation, storm fronts, thunderstorms, cold, warm and occluded fronts, typhoons and hurricanes) are described and sample radar screen photographs presented. The article is based on "various reports" of unspecified origin. *Subject Headings:* **1. Radar meteorology 2. Radar photographs.**—*G.T.*

1948

6G–12 551.594.6 551.501.81

Kerr, J. F., **Radio superrefraction in the coastal regions of Australia.** *Australian Journal of Scientific Research, Ser. A, Physical Sciences*, 1(4):443 463, Dec. **1948.** 14 figs., 9 refs. **MH-BH**—A study of geographical and meteorological factors affecting superrefraction of radio or radar echoes in and near Australia, based on reports from 112 R.A.A.F. radar warning stations, 1944–1945. (*Same item as* 2.3–173, March 1951 and 4D–186, April 1953, *MAB.*) *Subject Headings:* **1. Radar echoes 2. Anomalous radio propagation 3. Australia.**—*M.R.*

6G–13 551.577:551.501.81

Langille, R. C.; Gunn, K. L. S. and Palmer, W. M., **Quantitative analysis of vertical structure in precipitation.** *Canada. Defence Research Board. Radio Propagation Laboratory, Report* No. 1, July 1, **1948.** 64 p. 34 figs., 21 refs. **DWB**—During the summer of 1947 showers and continuous rain were observed in vertical section by a Microwave Height Finder radar. Photographic records of these observations have been analyzed, utilizing the close correlation between radar echo and mass of free rain water (M) per unit volume of atmosphere, previously established. The report provides sequences of the "M"-contoured vertical sections so obtained. The method of obtaining these sections is developed in detail. (*Same item as* 5.9–237, Sept. 1954, *MAB.*) *Subject Heading:* **1. Radar analysis of precipitation.**—*Authors' abstract.*

6G–14 551.501.8:778.3

Mironovitch, V., **Radiographie des systèmes nuageux par le radar.** [Radiography of cloud formations by radar.] *La Météorologie, Ser. 4,* No. 10:153–156, April–June **1948.** 17 figs., 5 refs. **DWB**—A summary of the uses made of radar for observations of storms, hurricanes and cloud formations, based in general on experience in America. Many excellent PPI scope photographs are reproduced. (*Same item as* 3.8–33, Aug. 1952, *MAB.*) *Subject Headings:* **1. Cloud observation 2. Radar storm detection 3. Radar photographs.**—*M. R.*

6G–15 551.501.81:551.551:629.135

Press, Harry and Binckley, E. T., **A preliminary evaluation of the use of ground radar for the avoidance of turbulent clouds.** *U. S. NACA, Technical Note,* No. 1684, **1948.** 13 p. 4 figs., 2 tables, 4 refs. **DLC**—Data obtained from 16 flights through convective clouds in Florida during the 1946 Thunderstorm Project operations, indicate that turbulence can be avoided or minimized by avoiding regions of radar echo as observed on the ground. In vicinity of radar echoes an effective gust velocity of 30 ft/sec will be exceeded once in 120 mi of flight, but only one in 1200 mi of flight if at least 2 mi from a radar echo. (*Same item as* 2H–116, Aug. 1951 and 3K–116, Nov. 1952, *MAB.*) *Subject Headings:* **1. Turbulence in clouds 2. Gustiness 3. Radar storm detection 4. Florida.**—*M. P. Kramer.*

6G–16 551.551:551.501.81

Steiner, Roy, **An evaluation of air-borne radar as a means of avoiding atmospheric turbulence.** *U. S. NACA, Research Memorandum,* L8101, Nov. 22, **1948.** 9 p. fig., 3 tables, 3 refs., eq. Mimeo. **DWB**—Gust-velocity measurements and air-borne radar observations obtained during a trans-continental flight in July 1947 have been analyzed as part of a general investigation of the uses of air-borne radar. The analysis indicates that some reduction in turbulence and a consequent reduction in the risk of encountering the larger gust velocities may be obtained by avoiding portion of clouds giving a radar echo. (*Same item as* 2H–122, Aug. 1951 and 3K–120, Nov. 1952, *MAB.*) *Subject Headings:* **1. Turbulence in clouds 2. Air-borne weather radar 3. Radar storm detection 4. Aeronautical meteorology.**—*Author's abstract.*

1949

6G–17 551.551:551.501.8:551.515.4

American Airlines System, **The development of an airborne radar method of avoiding severe turbulence and heavy precipitation in the precipitation areas of thunderstorms and the squalls.** Contract Noa (S)-9006, Task No. 1, Final Report, Sept. 15, **1949.** 35 p. 15 figs., refs. Summary p. 1–2. **DWB**—Data from 40 probings of thunderstorm clouds and 600 miles of flight indicated that areas of maximum rainfall gradient contain the most frequent and probably the heaviest gusts. (*Same item as* D–240, April 1950 and3 K–124, Nov. 1952, *MAB.*) *Subject Headings:* **1. Thunderstorm turbulence 2. Air-borne weather radar 3. Radar storm detection.**—*M. P. Kramer.*

6G–18 551.501.81:551.578.4

§*Canada. Army Operational Research Group, **Analysis of radar echoes from snow.** Its *Report,* No. 45, May 15, **1949.** 54 p. 23+figs. (some photostat), 11 tables. **DWB**—Numerous photographs made with 10.7 cm and 3.2 cm radar of snow during 1945–46 at Ottawa are analyzed and presented in this report. Data on height, intensity, size of flakes, range, storm structure and size and comparison of 2 types of equipment were obtained by use of ground radar and snow observation parties. Fixed positions for the latter were adopted because of difficulty and time consumed in moving about and setting up observation equipment. The snow observation parties measured average intensity of snowfall, size of crystals, visibility and type of snow crystals. Data, synoptic charts, PPI and RHI photos are presented. *Subject Headings:* **1. Radar snow observations 2. Stormy Weather Research Group 3. Ottawa, Canada.**—*M.R.*

6G–19 551.551:551.501.81:551.576

Jones, R. F., **Relation between radar echoes from cumulus and cumulonimbus clouds and the turbulence within these clouds: a report of the first year's operation of the cumulonimbus trials at the Meteorological Office Radar Station at East Hill in co-operation with aircraft from the Royal Aircraft Establishment at Farnborough.** *Great Britain. Meteorological Research Committee, MRP*, No. 484, April 14, **1949.** 16 p. 25 figs., 8 photos, 6 tables, 5 refs. Mimeo. **DWB**—It has been found that radar echoes are useful in locating the area within Cu-clouds where the largest size drops exist (probably the areas of greatest updrafts, severe turbulence) but the problem becomes how to distinguish areas of greatest turbulence in the absence of large drops. Study of radar weather echo records and accelerometer data from Spitfire aircraft indicate that distinct columns and troughs in the radar echo vertical cross sections are associated with up and down drafts respectively and are indicative of the severity of turbulence to be expected. (*Same item as* 3K–135, Nov. 1952, *MAB.*) *Subject Headings:* **1. Turbulence in clouds 2. Cumulonimbus clouds 3. Radar echoes from clouds.** —*M. P. Kramer.*

6G–20 551.501.81:551.578.4

§*Langille, R. C.; Palmer, William M. and Tibbles, L. G., **S-band radioechoes from snow.** *Canada. Army Operational Research Group, Report*, No. 26, June 14, **1949.** 29 p. numerous figs. and tables, eqs. **DWB**—Snow storms were observed on 9 occasions in Jan. and Feb. 1945 with MEW (10.7 cm) equipment at Ottawa. On 2 of these 9 days rain and snow occurred together. On 16 days in Feb. 1945 similar MEW equipment was used at Clinton, Ontario near Lake Huron. It was not possible to distinguish rain from snow echoes. Intensities of snow, masses of flakes, number of crystals, etc. are tabulated for days with snow and no echo, and of snow with echo. Besides detailed statistical and synoptic analysis of each case, vertical cross sections and horizontal grid maps show location and type of clouds and snow areas for each case. Conclusion is that heavy summer thunderstorm showers can be detected and thus avoided by aircraft, but that light snow in winter cannot be detected (which is considered fortunate as it would not prevent flight nor clutter up landing aids). *Subject Headings:* **1. Radar snow observations 2. Stormy Weather Group 3. Ottawa, Canada. I. Canada. Army Operational Research Group.**—*M.R.*

6G–21 551.515.4:551.551:551.501.81

Thompson, James K. and Liscomb, V. W., **An evaluation of the use of the ground radar for avoiding severe turbulence associated with thunderstorms.** *U. S. NACA, Technical Note*, No. 1960, **1949.** 10 p. 2 figs., 3 tables, 3 refs. **DWB**—Effectiveness of ground radar indicated for determining and avoiding regions of severe thunderstorm turbulence in sub-tropical and temperate regions. Ground radar increasingly effective with increasing altitude from 6000 up to 25,000 ft. (*Same item as* H–227, Aug. 1950 and 3K–143, Nov. 1952, *MAB.*) *Subject Headings:* **1. Thunderstorm turbulence 2. Radar storm detection.**—*H. P. Kramer.*

1950

6G–22 551.501.8:551.508.85:551.551:551.576.11

Great Britain, Royal Air Force. Air Transport Development Flight, **Trials of improved cloud and collision warning radar. Final report.** Its *Task number A.T.D.F.I.* (formerly T.C.D.U./BZ 58) Pt. 1, London, **1950.** Mimeo. 29 p. 20 plates, 5 refs. **GB-MO**—To test E. K. Cole Cloud Warning Radar Equipment, 67 hours were flown investigating clouds over Malaya and Sumatra. CuNb clouds were detected at ranges up to 40 mi, Cu up to 30 mi and very small Cu at ranges from 5–10 mi; 110 cloud penetrations were made, turbulence normally being less than expected. The maximum vertical acceleration recorded was ± 1 g. Turbulence was found to be no greater in the response area than in the rest of the clouds. Close association was found between position of response and precipitation area, but no method was discovered of predicting turbulence from any characteristic of the response. *Subject Headings:* **1. Radar cloud detection 2. Turbulence in clouds 3. Malaya 4. Sumatra.**—*From author's abstract.*

6G–23 551.501.81:551.515.4

Hilst, G. R. and MacDowell, G. P., **Radar measurements of initial growth of thunderstorm precipitation cells.** *American Meteorological Society, Bulletin*, 31(3):95–99, March **1950.** 4 figs., table, 4 refs. **DWB, MH-BH.** Also: German summary entitled **Die Entwicklung von Niederschlagszellen in einem Gewitter.** [Growth of precipitation cells in a thunderstorm.] *Umschau*, Frankfurt a.M., 50(22):683, Nov. **1950.** 3 figs. **DLC**—A thunderstorm near Cambridge, Mass. which spread steadily but rapidly in a horizontal plane and which developed vertically at a rate of 1000 ft/min during the first 10 min, was studied by means of PPI and RHI scope photographs and by inflight measurements of vertical gusts, drafts and liquid water content. Extreme turbulence was encountered (adjacent effective gusts of -17 and $+22$ ft/sec). Data presented effectively in

charts and graphs. (*Same item as* 6–47, June 1950, *MAB.*) *Subject Headings:* **1. Thunderstorm structure 2. Vertical velocities 3. Radar photographs 4. Cambridge, Mass.**—*M.R.*

6G–24 551.501.81:551.577

Hood, A. D., **Quantitative measurements at three and ten centimeters of radar echo intensities from precipitation.** *National Research Council of Canada, N.R.C.* No. 2155, June **1950.** 13 p. 7 photos, 10 figs., eqs. **DWB**—Permanent rainstorms were produced by photographic radar type-*A* displays in conjunction with the recording of meteorological data. The analysis proved that the rate of fall in rainstorms can be measured by radar with reasonable accuracy. Simultaneous quantitative measurements at 3 and 10 cm agree with both theory and previous experimental results showing that radar echoes are dependent on drop size distribution, and are proportional to the sum of the sixth power of the drop diameters contained in a unit volume. Quantitative measurements have given an absolute comparison of *X*-band and *S*-band performance and have illustrated the limitations of *X*-band as a useful frequency in meteorological work. The data may be applied to any radar to estimate the detection ranges of typical targets in rainstorms. *Subject Headings:* **1. Radar precipitation echo intensities.**—*Author's abstract.*

6G–25 551.507.352:551.508.7

Katz, R. E., **Airborne techniques for studying precipitation and precipitation clutter.** [Nov. **1950.**] 4 p. 5 figs., 3 refs. Mimeo. Abstracted from separated sheets. **DWB**—A disdrometer, capillary collector, electric field meter, wet and dry bulb thermometer and dew point meter were installed on a Navy PBM seaplane and used in the Philippines (1946), Panama (1947) and at Key West, Fla. (July 1950) in connection with radar measurements of liquid water content of clouds, rainfall, etc. It was found that the disdrometer gave readings 5 to 30 times as high as the capillary collector (which is considered to give more nearly representative values). Attempts to determine cause of errors are discussed. (*Same item as* 5.8–44, Aug. 1954, *MAB.*) *Subject Headings:* **1. Airborne instruments 2. Disdrometers 3. Capillary collectors 4. Liquid water content of clouds 5. Radar precipitation measurement. I. U. S. Naval Research Laboratory.**—*M.R.*

6G–26 551.501.8:551.515

Kennedy, E. Donald, **Weather and electronics research.** *Florida. University. Engineering and Industrial Experiment Station, Engineering Progress,* 4(4), *Leaflet Ser.*, No. 13, April **1950.** 2 p. 6 figs. Reprint from: *Journal of Southern Research,* Jan. **1950. DWB**—Major research projects now in progress at the University of Florida include studies of microwave reflections from rainstorms (using radar) and sferics studies, that is the measurement of intensity and location of sources of atmospheric parasites in connection with thunderstorm areas and hurricanes. Location of thunderstorms at distances of 300 mi is possible, the author claims. Examples of records are included. (*Same item as* 3.7–38, July 1952, *MAB.*) *Subject Headings:* **1. Meteorological research 2. Radar storm detection 3. Microwave reflections 4. Sferics 5. Florida.**—*M.R.*

6G–27 551.501.8:551.594.7(68)

King, J. S.; Hewitt, F. J. and Bozzoli, G., **Radio meteorology in southern Africa.** (In: African Regional Scientific Conference, Johannesburg, Oct. 17–28, 1949, [**Proceedings**], 2:41–44. **1950.** In English; French summary p. 41.) **DWB**—A discussion of the development of radio meteorology in South Africa, of the use of sferics for detecting thunderstorms and the application of microwave radar for precipitation detection in South Africa. The author discusses also the use of radar for upper wind measurement, the influence of meteorological conditions upon radar waves, the meteorological conditions likely to cause superrefraction, etc. A list of radiosonde stations operating in South Africa is given. (*Same item as* 3.10–34, Oct. 1952, *MAB.*) *Subject Headings:* **1. Radio meteorology 2. Sferics 3. Radar storm detection 4. South Africa.**—*I.L.D.*

6G–28 551.578.11:551.508.81

Langille, R. C., **The scattering of ten-centimetre radio waves by rain.** *Journal of Geophysical Research,* 55(1):51–52, March **1950.** 2 refs. **MH-BH**—Distribution in a vertical plane of mass of free rainwater in a shower (in mg/m^3) was found by plotting strength of waves back-scattered by a shower. Example shown. (*Same item as* 2.11–150, Nov. 1951, *MAB.*) *Subject Headings:* **1. Microwave scattering 2. Radar analysis of rain.**—*C.E.P.B.*

6G–29 551.574.1:551.577.11:551.508.85

McGill University. Macdonald Physics Laboratory, **Stormy weather research group.** Contract AF-19(122)-217, Progress Report, No. 3, Oct. 1–Dec. 31, **1950.** 7 p. graph. **DWB**—Brief general information on the project's progress in investigating cloud and precipitation physics and dynamics and the properties of clouds and precipitation from radar data. Special attention is given to noise texture of microwave echoes, particle-size distribution, intensity of continuous pre-

cipitation, scattering from inhomogeneous particles and an analysis of Ottawa snow data. (*Same item as* 4.11–204, Nov. 1953, *MAB.*) *Subject Headings:* **1. Cloud physics research 2. Precipitation physics 3. Radar meteorology. I. Marshall, J. S.**—*G.T.*

6G–30 551.501.8:551.594.7:621.396.9

Maynard, R. H., **Radar-Meteorologie.** [Radar-meteorology.] *Umschau*, Frankfurt a.M., 50(16):504–506, Aug. **1950.** 5 figs., ref. **DLC**—Basic principles of meteorological radar measurement are explained and patterns on the radar screen which show different shapes indicating echoes from showers, storms, fronts or typhoons are described. Three radar screen photographs representing echoes from a thunderstorm, a cold front and a typhoon are reproduced. Measuring and control equipment used by U. S. Navy Weather Service are shown on two photographs. (*Same item as* 3.5–39, May, 1952, *MAB.*) *Subject Headings:* **1. Radar meteorology 2. Radar echoes 3. Radar storm detection 4. Radar photographs.**—*G.T.*

1951

6G–31 551.577.37:551.501.81

Atlas, David and Banks, Harold C., **The interpretation of microwave reflections from rainfall.** *Journal of Meteorology*, 8(5):272–282, Oct. **1951.** 21 figs., 14 refs., 13 eqs. **MH-BH**—Equations of echo intensity are set out in terms of reflectivity of rain, attenuation due to intervening rain and distance of storm. It is shown that the maximum echo intensity is nearer than maximum rainfall intensity except for wave lengths exceeding 7 cm and small intense storms. Rainstorm models, resembling typical thunderstorms, are set up and one- and two-dimensional plots of echo intensity for 10 cm and 3.2 cm radar discussed. In isolated storms the position of maximum intensity can be determined, but with a storm behind another the contours bear little resemblance to real structure. (*Same item as* 3.5–242, May 1952, *MAB.*) *Subject Headings:* **1. Rainfall structure 2. Radar storm detection.**—*C.E.P.B.*

6G–32 551.501.81:551.515.13:551.515.8

§Austin, Pauline M., **Radar observations of a frontal storm.** *American Meteorological Society, Bulletin*, 32(4):136–145, April **1951.** diagrs., photos, 6 refs. **MH-BH**—The structure of the frontal storm that passed across New England, Feb. 13–14, 1948 and the development of frontal precipitation is investigated by means of continuous time sequence photographs from a single radar installation. The general weather situation is illustrated by synoptic maps and with the aid of radar scope photographs. The author discusses the typical sequence of radar observations corresponding to warm front precipitation, the layer aloft, characteristics of precipitation following layer structure, the repetition of warm front sequence and the precipitation associated with the cold front. (*Same item as* 3.5–40, May, 1952, *MAB.*) *Subject Headings:* **1. Radar storm detection 2. Frontal storms 3. Air masses 4. New England.**—*I.L.D.*

6G–33 551.574.1:621.396.11

Bartnoff, Shepard and Atlas, David, **Microwave determination of particle-size distribution.** *Journal of Meteorology*, 8(2):130–131, April **1951.** 3 refs., 3 eqs. **MH-BH**—A preliminary note on the theory leading to research on the usefulness of microwave propagation (attenuation) methods for determination of the liquid water content of clouds and actual drop-size distribution in the cloud. The reflectivity factor $Z = \Sigma N_i d_i^6$ and the audio frequency spectrum $F(w)$ of pulse to pulse fluctuations have been investigated. (*Same item as* 3.2–134, Feb. 1952, *MAB.*) *Subject Headings:* **1. Microwave propagation 2. Water content of clouds 3. Drop size distribution.**—*M.R.*

6G–34 551.501.81:621.396.029.6

Bemis, Alan Cogswell (*M.I.T.*), **Reflection characteristics of weather clutter.** [1951] 11 p. 13 figs., 16 refs. Photostat of typescript. **DWB**—The usefulness as well as the undesirable aspects of reflection of microwaves (10 cm) from raindrops as evident on radar scopes is treated and the means of increasing or decreasing the reception of such reflections discussed. Numerous examples of radar photographs illustrate the different applications to forecasting movement of fronts, cyclones, thunderstorms, rain areas or icing levels, or the study of liquid water content of rain. *Subject Headings:* **1. Radar storm detection 2. Microwave reflection from raindrops. I. Massachusetts Institute of Technology. Weather Radar Research Project.**—*M.R.*

6G–35 551.578.1:551.508.1

Bowen, E. G., **Physics of natural rain formation.** *Meteorological Magazine*, London, 80(949): 191–193, July **1951.** 3 refs. **DWB**—Report of lecture at Royal Meteorological Society, April 18, 1951 by author on results of radar investigations of rain falling from nonfreezing clouds and

coalescence theory of raindrop formation. (*Same item as* 3.4–197, April 1952, *MAB.*) *Subject Headings:* **1. Rain formation 2. Rain from nonfreezing clouds 3. Radar analysis of rain.**—*C.E.P.B.*

6G–36 551.577.11:621.396.9 551.501.81

Bowen, E. G., **Radar observations of rain and their relation to mechanisms of rain formation.** *Journal of Atmospheric and Terrestrial Physics*, 1(3):125–140, **1951.** 7 figs., 3 tables, 16 refs. **MH-BH.** Also his: **Radar observations of rain and mechanism of rain formation.** *I.U.G.G., Association of Meteorology, 9th, Brussels, Aug. 1951, Procès-Verbaux des Séances, [Mémoires et discussion]* p. 135–136. Its *AIM* No. 9/c. Also issued as *Uppsala. Universitet. Meteorologiska Institutionen, Meddelande*, No. 39. Abstracted from reprint. **DWB**—Investigations of radar echoes from rain at Sydney, New South Wales, in conjunction with upper air ascents show two types. A band of high echo just below freezing level is due to melting of ice particles and is associated with formation of rain in a mixture of supercooled droplets and ice needles. In such clouds another band may be formed at −16°C by spontaneous freezing of large drops. The second type, columnar echoes from convection clouds, is due to coalescence of cloud droplets without ice particles. (*See items* 2H–204, Aug. 1951 and 2.11–142, Nov. 1951, *MAB.*) This is followed by discussion in which P. A. Sheppard and H. W. L. Absalom participated. *Subject Headings:* **1. Radar precipitation echoes 2. Rain formation.**—*C.E.P.B., I.L.D.*

6G–37 551.501.8:06

Bowen, E. G., **Recent work of the Radiophysics Division, C.S.I.R.O.** *Institution of Radio Engineers (Australia), Proceedings, Sydney*, 12:99–108, **1951.** 18 figs. **DLC**—Includes an account of structure of "freezing" and nonfreezing rain as shown by radar from the air and ground, with photos; measurement of raindrop sizes and water content in the air by a transmitter carried by balloon; and experiments in rain making by dry ice. Vertical air velocity in a cloud was measured by airborne radar and cloud samples were taken. Wind finding by radar using balloons coated with a silver film gave profiles up to 100,000 ft. A glider carrying meteorological instruments and homing on a radio beam is being developed. Sec. 3 deals with radio astronomy. (*Same item as* 3.10–2, Oct. 1952, *MAB.*) *Subject Headings:* **1. Radar analysis of rain 2. Cloud physics 3. Artificial precipitation 4. Radarsondes.**—*C.E.P.B.*

6G–38 551.509.67 551.574.1

Braham, R. R.; Reynolds, S. E. and Harrell, J. H., Jr., **Possibilities for cloud seeding as determined by a study of cloud height versus precipitation.** *Journal of Meteorology*, 8(6):416–418, Dec. **1951.** fig., 2 tables, 4 refs. **MH-BH**—In New Mexico, with cloud-top temperature above −12°C no radar echoes were found, from −12 to −24°C only one-fifth of the clouds gave echoes. Below −24°C presence of CuNb increased frequency of echoes. Seeding from ground by AgI had no effect. For summer seeding to be effective, cloud must extend from below 14,000 ft to at least 22,000 ft. (*Same item as* 3.5–96, May 1952, *MAB.*) *Subject Headings:* **1. Artificial precipitation 2. Cloud physics 3. Cloud seeding 4. Cloud height.**—*C.E.P.B.*

6G–39 551.594.6

Broc, Jean, **Observation d'échos de radar d'une région sans nuages.** [Observation of radar echoes in a cloudless region.] *Académie des Sciences, Paris, Comptes Rendus*, 232(22):2034–2036, May 28, **1951.** 2 photos. **DWB**—A description and photographs of radar echoes received from the lower levels of the atmosphere in the absence of clouds. (*Same item as* 3.2–198, Feb. 1952, *MAB.*) *Subject Headings:* **1. Radar echoes 2. Cloudless regions 3. Monaco 4. Mediterranean.**—*I.L.D.*

6G–40 551.501.8:551.577.21

Bunting, Donald C. and Latour, Marinus H., **Radar-rainfall studies in Ohio.** *American Meteorological Society, Bulletin*, 32(8):289–294, Oct. **1951.** 8 figs., 9 refs. **MH-BH**—Report on quantitative measurements of precipitation by radar conducted at Wilmington, Ohio in 1948, by a University of Florida research team Through gradually reducing the radar receiver gain, sequences of varying "power-received" contours are obtained from which isohyets are calculated using an empirical equation derived by R. Wexler. Results are compared with those obtained from rain gage data and claimed to be satisfactory allowing for certain sources of error. A radar photographic sequence is presented and results of the experiments shown in charts. (*Same item as* 3.7–37, July 1952, *MAB.*) *Subject Headings:* **1. Radar rain detection 2. Rainfall intensities 3. Wilmington, Ohio.**—*G.T.*

6G–41 551.508.85:551.577.11

§Cunningham, Robert M., **Some observations of natural precipitation processes.** *American Meteorological Society, Bulletin*, 32(9):334–343, Nov. **1951.** 12 figs., 6 refs. **MH-BH**—Report of four flights arranged by the Signal Corps' project carried out at M.I.T. Weather Radar Research

Project with a view to investigating cloud and precipitation structures. Synoptic charts, radarscope photographs and a cross section of the lower atmosphere with the radar echo and flight path indicated are presented for each flight. The process of particle-growth is stated as taking place in five specified regions each corresponding to a phase in the process. These regions were investigated separately during radar flight observations. (*Same item as* 4.4–201, April 1953, *MAB.*) *Subject Headings:* **1. Radar analysis of precipitation 2. Precipitation formation 3. Cloud structure. I. U. S. Signal Corps II. Massachusetts Institute of Technology. Weather Radar Research Project.** —*G.T.*

6G–42 551.501.81:551.578.1

Forsgren, Sven K. H. and Perers, Olof F., **Vertical recording of rain by radar.** *Göteborg, Sweden. Chalmers Tekniska Högskola, Handlingar*, No. 107, **1951.** 19 p. 11 figs. (incl. photos), 23 refs., 7 eqs. Its *Reports from the Research Laboratory of Electronics*, No. 20. **DWB**—Results of tests made in the summer of 1949 at Göteborg with an AN/CPN-6 radar on 3.2 cm wave length, and 7.5 KW output and with recording on 2 synchroscopes, one used for visual recordings. All equipment is illustrated, and resulting records of thunderstorms, rain showers, etc. reproduced. The relationship of the choes to the freezing level (and the Bergeron-Findeisen theory) are kept in mind in the discussion, as well as the other meteorological conditions such as fronts, fall velocities of drop, temperature, drop size, and the microwave aspects such as shielding, multiple scattering or reflection and attenuation. Triple echoes recorded on July 6 are illustrated and explained. (Run by title only *as* 2H–228, Aug. 1951, *MAB.*) *Subject Headings:* **1. Radar rain recording 2. Vertical radar recordings.**—*M.R.*

6G–43 551.577:621.396.9

Jones, R. F., **Aircraft observations of radar reflecting particles above the freezing level.** *Great Britain. Meteorological Research Committee, M.R.P.* 683, S.C.III/113, 16th Nov. **1951.** 12 p. 2 tables, 10 refs. Mimeo. **DWB**—Observations of character of precipitation, temperature and icing on 8 flights in cloud in and above freezing level, in conjunction with ground radar, are discussed. Echoes from above freezing level are associated with numerous ice crystals $\frac{1}{2}$ mm or more long, the bright band occurring at the change to raindrops. Other observations describe flights through *Cu* and *CuNb* above freezing level, with columnar echoes from supercooled water, and usually icing. (*Same item as* 3.8–145, Aug. 1952, *MAB.*) *Subject Headings:* **1. Radar precipitation echoes 2. Airplane observation.**—*C.E.P.B.*

6G–44 551.577.11

Jones, R. F., **Rain from non-freezing clouds.** *Meteorological Magazine*, London, 80(951):273–274, Sept. **1951.** 2 photos. **MH-BH**—On July 18, 1951, in SE England, precipitation radar echoes were received from clouds with tops only 1000–8500 ft. These were investigated by aircraft; free air temperature at 7500–8800 ft was 45.7–44.6°F. Some rain reached the ground. Radar photos shown. (*Same item as* 3.2–143, Feb. 1952, *MAB.*) *Subject Headings:* **1. Rain from non-freezing clouds 2. Radar echoes 3. Southeast England.**—*C.E.P.B.*

6G–45 551.501.81:551.515.2

Jorgensen, R. C. and Gerdes, W. F., **The Dow Chemical Company leads industry in using radar for hurricane detection.** *American Meteorological Society, Bulletin*, 32(6):221–224, June **1951.** 3 figs. **MH-BH**—A description of the radar unit used in the hurricane detection program and illustrations of the apparatus are given. The general method of hurricane detection by means of radar is discussed briefly. (*Same item as* 3.5–41, May 1952, *MAB.*) *Subject Headings:* **1. Radar storm detection 2. Hurricanes.**—*I.L.D.*

6G–46 551.501.8:551.508.85

Kennedy, George, **Airport radar eye spots storms as well as planes.** *The Star*, Wash., D. C., Sept. 10, **1951.** 2 photos. **DLC**—Radar equipment at Washington National Airport, which according to author "is believed to be the most powerful radar apparatus used in Weather Bureau forecasting," is described and illustrated, a few details of radar precipitation forecasting are discussed in a popular manner and an example of the use of radar given in conjunction with a thunderstorm. (*Same item as* 3.8–32, Aug. 1952, *MAB.*) *Subject Headings:* **1. Radar storm detection 2. Radar equipment 3. Washington National Airport 4. Precipitation forecasting 5. Washington, D. C.** —*G.T.*

6G–47 551.501.81:551.577.11

Kerker, Milton and Hitschfeld, Walter, **Effect of particle shape and secondary scattering on microwave reflections from clouds and precipitation.** McGill University, Macdonald Physics Laboratory, Stormy Weather Research Group, Contract AF19(122)-217, Research Report MW-1, March **1951.** 32 p. 6 figs., 3 tables, 11 refs., 23 eqs. **DWB**—In order to distinguish between rain

and snow when interpreting microwave returns (from radar), the effects of particle shape on the intensity and polarization of the beams is considered. The data for scattering by small randomly oriented rod-shaped and plate-shaped (prolate and oblate) spheroids is given in tables and the data obtained for secondary scattering compared graphically. It is concluded that the scattering cross section for a particle of given volume is least for a sphere, greater by a factor of <2 for ice spheroids and much greater for water particles when deformation is extreme. (*Same as item* 3.6–16, June 1952, *MAB.*) *Subject Headings:* **1. Radar precipitation echoes 2. Microwave scattering.** —*M.R.*

6G–48 551.501.81:551 577

Kerker, M.; Langleben, P. and Gunn, K. L. S., **Scattering of microwaves by a melting spherical ice particle.** *Journal of Meteorology*, 8(6):424, Dec. **1951.** fig., 2 refs. **MH-BH**—Back scattering of 10 cm. radar from a melting ice sphere of radius 0.2 cm. is calculated by theory of ADEN and KERKER. Results show a rapid increase during early stages of melting. (*Same item as* 3.8–34, Aug. 1952, *MAB.*) *Subject Heading:* **1. Radar precipitation echoes.**—*C.E.P.B.*

6G–49 551.501.81:551.578.45

Langille, R. C. and Thain, R. S., **Some quantitative measurements of three-centimeter radar echoes from falling snow.** *Canadian Journal of Physics*, 29(6):482–490, Nov. **1951.** 6 figs., 5 refs., eqs. **DWB**—Experimental results indicate that fairly accurate calculations of snow echoes are possible by employing Ryde's formula, regardless of the rate of the snowfall or the quality of the radar set. Size distribution of the snowflakes plays an important role in the echo to be expected from a particular snowstorm. (*Same item as* 3.10–35, Oct. 1952, *MAB.*) *Subject Headings:* **1. Radar storm detection 2. Radar echoes from snow.**—*W.N.*

6G–50 551.501.81:551.578.1(44)

Lhermitte, Roger, **Sur le déplacement anormal de certains échos de pluie.** [On the abnormal displacement of certain rain echoes.] *Académie des Sciences, Paris, Comptes Rendus*, 233(20):1210–1212, **1951.** fig., table. **DWB**—Periodic photographs of the radar screen during passage of storms, when projected rapidly with a movie camera, showed abnormal movement of certain rain echoes when compared with the movement of the general rainfall area or with general upper air winds measured during balloon ascents at Trappes. However, the latter confirm a slight rotation in the cloud base and nonstable flow above 1 or 2 km. Normal and abnormal propagation of echoes and related wind aloft data are tabulated for 3 storms in May and June, 1951. (*Same item as* 3.8–35, Aug. 1952, *MAB.*) *Subject Headings:* **1. Radar observations 2. Rainfall area movements 3. Upper air wind data 4. Trappes, France.**—*M.R.*

6G–51 551.501.81

†Ligda, Myron G. H. (*M.I.T.*), **Radar storm observation.** (In: **Compendium of Meteorology.** Boston, American Meteorological Society, **1951.** p. 1265–1282. 16 figs., table, 71 refs., 4 eqs.) **MH-BH**—Assuming the validity of the theoretical basis of the application of radar to hydrometeor detection and to the study of storm structure, the author presents a comprehensive review of the observational and practical aspects of radar storm detection. The article includes: a brief history of the beginning of radar storm detection before World War II; an analysis of the meaning of the factors pertaining to the radar system in terms of which the power received at the antenna due to the echo from precipitation is expressed; the problem of the observational verification of radar storm detection theory; the observation of weather phenomena on radar scopes including a description of the type of scopes (A scope, R scope, Plan Position Indicator or P.P.I. Scope and the Range Height Indicator or R.H.I. scope), and a detailed description of the scopes during the various types of precipitation (frontal and orographic precipitation, hurricanes or typhoons and instability showers); an analysis of the radar storm echo signal by nonvisual means namely, the pulse integrator, the radar signal spectrograph and storm echo signal contouring and by the use of radar scope photography. The future of radar storm detection is discussed with reference to its use in forecasting, the development of instruments such as horizon to horizon R.H.I. scope and the Gated Range Height Indicator and the use of radar for research in physical meteorology. (*Same item as* 3.10–10, Oct. 1952, *MAB.*) *Subject Headings:* **1. Radar storm detection 2. Radar photographs.**—*I.L.D.*

6G–52 551.574.1:551.577.11:551.508.85

McGill University. Macdonald Physics Laboratory, Stormy Weather Res. Group, **Theoretical investigation of cloud and precipitation physics and dynamics, and the properties of clouds and precipitation, as determined from the analysis of data provided by radar probings of storms.** Contract AF19(122)-217, Progress Report No. 5, June 30, **1951.** 7 p. graph. **DWB**—Brief descriptions of progress on the following projects are given: 1), noise texture of microwave echoes from cloud and precipitation; 2), effect of coalescence between raindrops on size distribution; 3), the intensity

of continuous precipitation; 4), microwave scattering from concentric spheres of different refractive indexes; 5), review of cloud and precipitation studies by microwaves. (*Same item as* 4.11–205, Nov. 1953, *MAB.*) *Subject Headings:* **1. Cloud physics research 2. Precipitation physics 3. Radar meteorology.**—*I.L.D.*

6G–53 551.501.81:551.577

Marshall, J. S. and Hitschfeld, Walter, **Interpretation of the fluctuation echo from randomly distributed scatterers, Pt. 1.** McGill Univ. Macdonald Physics Laboratory, Contract AF19(122)-217, Scientific Report, MW-4, Oct. **1951.** 64 p. figs., 10 refs. Also: Wallace, P. R., **Interpretation of the fluctuating echo from randomly distributed scatterers, Pt. 2.** *Ibid.*, MW-6, Dec. **1951.** 37 p. figs., 2 tables, 6 refs., eqs. **DWB**—When a microwave pulse travels through precipitation the signal received by back scattering has an average intensity which equals the sum of intensities from each particle, which provides a quantitative estimate of the amount of precipitation over a period of time. In the first report the random fluctuations of a signal about its average value are investigated theoretically and by analogue in order to find methods of improving the information available by changing methods of pulsing or scanning. By smoothing, a slightly more accurate value can be obtained. But by using changing frequency from pulse to pulse, consecutive sweeps are independent (if change is $1/\tau$ where τ is pulse duration). MARKOFF's method of studying echo from random scatterers (in Pt. 2) and the probability distribution of echo intensity were determined by calculations of the random-walk type. A sharper definition of mean intensity was obtained by continuous averaging rather than averaging echoes from independent scattering regions only. The degree of independence of signals obtained from the same scatterers with varying frequency was determined and, finally, a simple picture found to illustrate development of echo in time, in order to provide a basis for autocorrelation studies. *Subject Headings:* **1. Radar precipitation echoes 2. Random radar echoes.**—*M.R., Authors' abstract.*

6G–54 551.508.85:551.578.41:551.574.1

§Marshall, J. S. and Gunn, K. L. S., **Measurement of snow parameters by microwave.** McGill University. Macdonald Physics Laboratory, Contract AF 19(122)-217, Research Project MW-2, May **1951.** 28 p. charts, graphs, refs. **DWB**—The authors have analyzed radar observations made by LANGILLE (1951) on falling snow at Ottawa, showing a good correlation between Z (the sum of the 6th powers of the diameter) and R (snowfall), and evidence that equal precipitation rates, whether rain or snow, give equal values of Z. Relation to mechanism of melting region is considered; the determination of size distribution from Z and R is discussed and shown graphically, and synoptic charts and a discussion of relation of weather to size distribution given for several situations. (*Same item as* 3.11–67, Nov. 1952, *MAB.*) *Subject Headings:* **1. Radar analysis of precipitation 2. Radar echoes from snow 3. Drop size distribution 4. Ottawa, Canada.**—*M.R.*

6G–55 551.5:06 551.501.81

Meteorology at the British Association meeting in Edinburgh, Aug. 1951. *Weather*, 6(11):338–339, Nov. **1951. MH-BH**—Brief summaries of papers presented at the meeting: Paton, J., **Auroras and luminous night clouds.** Jones, R. F., **Radar echoes from precipitation.** Mason, B. J.; Brewer, A. W. and Browne, I. C., [Discussion on] **Natural and artificial production of atmospheric precipitation.** (*Same item as* 3.4–16, April 1952, *MAB.*) *Subject Headings:* **1. Conferences 2. Luminescent clouds 3. Radar precipitation echoes 4. Artificial precipitation.**—*C.E.P.B.*

6G–56 551.574.1:551.594.7

Neumann, J., **Radar in cloud research.** (In: Israel. Rainfall Research Committee, **Symposium on artificial rain.** Hakirya, Aug. **1951.** p. 40–47. 7 figs., 18 refs. In Hebrew; English summary p. 12–13.) **DWB**—A discussion of RAYLEIGH's theory of the scattering of electromagnetic radiation by spherical particles and of its relevance to radar and the application of radar to cloud research, to cloud physics studies and to experiments on artificial rainfall. (*Same item as* 3.11–181, Nov. 1952, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Artificial precipitation 3. Radar cloud research.**—*I.L.D.*

6G–57 551.501.81:016

†Nupen, Wilhelm, **Selective annotated bibliography on radar as applied to meteorology.** *Meteorological Abstracts and Bibliography*, Boston, 2(8):680–711, Aug. **1951.** 232 refs. **MH-BH**—A bibliography of 232 annotated references to material on the application of radar or microwave equipment to observation of meteorological elements. The entries are arranged in chronological order and in alphabetical order by author within each year. An outline of contents furnishes a detailed guide to the scope of the material included. (*Same item as* 6B–102, Feb. 1955, *MAB.*) *Subject Heading:* **1. Bibliography on radar meteorology.**—*M.L.R.*

6G–58 551.578.1:551.507.352:629.13

Rain-trainer. *Flight*, London, 59(2202):393–394, April 6, **1951.** 2 figs. **DLC**—Research on cloud physics pursued by the Commonwealth Scientific and Industrial Research Organization in Australia, under the leadership of E. G. BROWN, is reported to include measurements with airborne radar. Characteristics of some typical radar echoes are discussed and one echo from heavy rain and one from ice-crystals falling through cloud presented in photos. Installation of equipment carried by the DC-3 used in flights is shown in a schematic drawing. Data on aircraft icing were also obtained during the flight and cloud water content was measured through water collectors. (*Same item as* 5.6–226, June 1954, *MAB.*) *Subject Headings:* **1. Rain observation in clouds 2. Air plane observations 3. Radar precipitation echoes 4. Icing of aircraft.**—*G.T.*

6G–59 551.501.81:551.594.7

Wexler, Raymond (*Imperial Col. of Sc. and Tech.*), **Theory of observation of radar storm de tection.** (In: **Compendium of Meteorology.** Boston, American Meteorological Society, **1951** p. 1283–1289, 4 figs., 2 tables, 16 refs., 6 eqs.) **MH-BH**—The basic theory of radar storm detection together with the equations for detecting particles of scattering by electromagnetic energy propagated isotropically from their source and the equation for storm detection including the effect of attenuation are presented. The refraction of radio waves in the atmosphere, the range-height relationship for refraction; attenuation of microwaves by absorption of oxygen and water vapor and by absorption of scattering from cloud and precipitation; the vertical structure of precipitation as revealed by radar studies, the bright band observed on the radar scope, RYD's explanations of this phenomenon the presence of an upper band in the bright band reported by BOWEN; and the horizontal structure of precipitation as indicated by the PPI scope are discussed. Research problems such as the relation ship between the rate of rise of the visual top and echo top in growing thunderstorms, coagulation and chain reaction effects on heavy rain and characteristics of precipitation echoes during formation of the bright band are suggested. (*Same item as* 4.6–14, June 1953, *MAB.*) *Subject Headings* **1. Radar storm detection 2. Radar propagation 3. Radar echoes.**—*I.L.D.*

1952

6G–60 551.501.8

*Atlas, David (*Air Force Cambridge Res. Center*), **Microwave scattering from nonspherica hydrometeors.** *Illinois. State Water Survey Division, Bulletin*, No. 41:269–276, **1952. DWB**— Author considers quantitatively the scattering from nonspherical particles, based on GAN's theory (scattering from ellipsoids), and concludes with a discussion of some of the effects these particles play in determining the nature of the bright band. The results are presented in curves. Scattering from non-spherical particles is more intense if randomly oriented or if direction of orientation is parallel to the major axes, but less intensely if oriented parallel to the minor axes. Low density snowflakes scatter like spheres regardless of shape or orientation. *Subject Headings:* **1. Bright band echoes 2. Microwave scattering.**—*M.R., W.N.*

6G–61 551.501.81:551.57

*Austin, Pauline M. (*M.I.T.*), **Comparison of average radar signal intensity with rainfall rate** *Illinois. State Water Survey Division, Bulletin*, No. 41:227–233, **1952. DWB** –The results (in curves) of the different methods of measurements of rainfall rate and radar signal intensities as applied at M.I.T., Weather Radar Project indicate: 1), No basic disagreement with HOOPER and KIPPAX's results although both sets of observations show lower radar signal intensities than expected from theoretical considerations, 2), In the same shower (or storm)—whether light or heavy rain—the constitution is the same more or less. However it appears that the drops are very much larger in the early part of each shower. 3), The 7 db. below the calculated value may be due to undetected loss somewhere in the radar set (10 cm. SCR-615 B). Possible influencing factors are discussed. *Subject Headings:* **1. Radar precipitation echoes 2. Radar signal intensity 3. Radar sensitivity.**—*W.N.*

6G–62 551.501.81:551.57

Austin, Pauline M. (*M.I.T.*), **Study of the amplitude distribution function for radar echoes from precipitation.** Massachusetts Institute of Technology. Dept. of Meteorology, Weather Radar Research, Contract DA-36-039-sc-124, Technical Report No. 17, May 31, **1952.** 36 p. 5 figs. 6 refs., eqs. **DWB**—Various observed amplitude distribution functions are compared with the theoretical expectations given by KERR and a fairly good agreement was found using better calibrated measurements. Theoretical derivations for groups of scatterers in random positions are given. (*Same item as* 5.3–40, March 1954, *MAB.*) *Subject Headings:* **1. Radar precipitation echoes 2. Microwave scattering.**—*A.A.*

6G–63 551.501.8:06

Bemis, Allan C., **Census of radar-weather projects.** *Illinois. State Water Survey Div., Bulletin*, No. 41:193–197, **1952. DWB**—The United States, British and Australian research projects in microwave propagation and study of clouds or storms by use of radar are listed under two main subject headings: 1) Weather-radar research projects—of which 5 are on microwave propagation, 4 on general weather radar, 9 on cloud physics, hydrology and storm detection, and 2) Weather-radar development projects—of which 9 are on instrumentation and 5 on application. Details of each project (supporting agency, purpose and equipment) are also given. (*Same item as* 4.10–31, Oct. 1953, *MAB.*) *Subject Headings:* **1. Radar weather projects 2. Microwave propagation studies. I. Marshall, John S. II. Langleben, M. P. III. Rigby, Caroline.**—*W.N.*

6G–64 551.574.1

Boucher, Roland J., **Empirical relationship between radar reflectivity drop size distribution and liquid water content in clouds.** Mount Washington Observatory, Contract AF 19(122)-399, June 30, **1952.** 14 p. 4 figs., 3 tables, 6 refs. **DWB**—A cloud droplet impinger, developed by the staff of the Mount Washington Observatory is described. Cloud samples obtained on the summit of Mt. Washington, N. H., with this instrument are analyzed and the results compared with simultaneous multicylinder observations. Values of radar reflectivity, Z, computed from the Mount Washington impinger observations and from aircraft observations in Germany by DIEM (1948) are correlated with the median volume diameter, d_0, and the liquid water content, W, obtained from the same observations. For any given value of d_0, it is found that Z increases approximately linearly with increasing W. The regression of log W on log Z results in the equation: $Z = 0.0370\ W^2$. (*Same item as* 6.3–229, March 1955, *MAB.*) *Subject Headings:* **1. Radar analysis of drops 2. Liquid water content of clouds 3. Cloud droplet impinger.**—*Author's abstract.*

6G–65 551.501.81:551.577.1

Browne, Ian C. and Robinson, N. P., **Cross-polarization of the radar melting-band.** *Nature*, London, 170(4338):1078–1079, Dec. 20, **1952.** 2 tables, 6 refs. **DWB**—When plane-polarized radiation is scattered by nonspherical particles, part of the back-scattered energy is polarized at right angles to the incident wave. Observations at Malvern and Cambridge show that this component is greater in the melting band than below and above freezing level. This may mean that particles in the melting region remain nonspherical until melting is almost completed. It may be useful to detect small quantities of ice in rain clouds. (*Same item as* 4.7–23, July 1953, *MAB.*) *Subject Headings:* **1. Radar precipitation echoes 2. Cambridge, England.**—*C.E.P.B.*

6G–66 551.501.81:551.515.8:551.577.11

Browne, Ian C., **Precipitation streaks as a cause of radar upper bands.** *Royal Meteorological Society, Quarterly Journal*, 78(338):590–595, Oct. **1952.** 2 figs., 2 tables, 3 refs., 2 eqs. **DWB**—Upper bands of enhanced radar echoes were investigated with 3 cm radar at Cambridge, England. At 9000 ft above freezing level downward velocity is 20 ft/sec, decreasing with time. They are attributed to precipitation streaks in a region of vertical wind shear; calculated and observed fall velocities agree. (*Same item as* 4.2–32, Feb. 1953, *MAB.*) *Subject Headings:* **1. Precipitation streaks 2. Radar precipitation echoes 3. Cambridge, England.**—*C.E.P.B.*

6G–67 551.594.7

Christall, F. I. and Cubitt, J. D., **Unusual radar performance, Red Sea.** *Marine Observer*, 22(55):14–15, Jan. **1952. DWB**—March 1, 1951. Pronounced echoes at 50,000–60,000 yards separated by a gap from normal echoes at 30,000 yards. Example of superrefraction. (*Same item as* 3.9–236, Sept. 1952, *MAB.*) *Subject Headings:* **1. Superrefraction 2. Radar echoes.**—*C.E.P.B.*

6G–68 551.574.1(08)

Colloquium on Microwave Meteorology, Aerosols and Cloud Physics, McGill University, Sept. 1950. **Proceedings.** Ralph J. Donaldson, Jr. (*ed.*). *U. S. Air Force, Cambridge Research Center, Geophysical Research Center, Geophysical Research Papers*, No. 13, May **1952.** 123 p. 32 figs., refs. **DWB**—The purpose of the Colloquium held at Montreal, Canada, on Sept. 18 and 19, 1950 under the auspices of U. S. Air Force Cambridge Research Center, was to assemble the various groups conducting research on the physics of clouds and precipitation under sponsorship of the Research Center and also to sum up present knowledge on several aspects of cloud physics, especially the growth and distribution of water droplets. The proceedings contain illustrated text of lectures and discussions. Individual papers dealt with separately. (*Same item as* 4.11–200, Nov. 1953, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Symposia. I. Donaldson, Ralph J., Jr.** (*ed.*).—*G.T.*

6G–69 551.594.7:551.510.52:621.396.9

Crain, C. M. and Gerhardt, J. R., **Measurements of the parameters involved in the theory of radio scattering in the troposphere.** *Institute of Radio Engineers, New York, Proceedings*, 49(1):

50–54, Jan. 1952. 5 figs., table, 6 refs., 2 eqs. **DLC**—Preliminary measures of the scale and the intensity of turbulence were obtained by direct measurements of the variation of the index of refraction and the associated temperature fluctuations from 10 in. to 50 ft above the ground. The observations have been carried out by the Electrical Engineering Research Laboratory of the University of Texas since 1948–49. It is shown that the instantaneous patterns of temperature, moisture or refractive index generally have a magnitude significantly greater than zero. Observations to 300 ft above the ground will be made. (*Same item as* 4.1-271, Jan. 1953, *MAB.*) *Subject Headings:* **1. Radio wave scattering 2. Troposphere 3. Refractive index 4. Temperature effects.**—*W.N.*

6G–70 551.57:551.515.1

Cunningham, Robert M., **Distribution and growth of hydrometeors around a deep cyclone.** Massachusetts Institute of Technology. Dept. of Meteorology. Contract DA-36-039-sc-124, Project DA 3-99-05-022, Technical Report, No. 18, May 9, 1952. 59 p. 47 figs., 6 tables, 37 refs. **DWB**—A complete analysis made for a single storm (April 3, 1951) by means of an instrumented aircraft and radar precipitation echoes. Results compared with those from other storms. Author presents surface and upper level charts, gives numerous cross sections based on aircraft soundings, compares radar photographs with recorded precipitation and computes the growth of hydrometeors during their fall, considering fall velocity, sublimation, evaporation, coalescence, etc. (*Same item as* 5.4–171, April 1954, *MAB.*) *Subject Headings:* **1. Cyclone structure 2. Hydrometeors 3. Drop accretion 4. Cloud physics 5. Radar precipitation echoes.**—*A.A.*

6G–71 551.501.81:551.577.21

Farnsworth, Gerald (*Ill. St. Water Survey*), **Quantitative radar-rainfall problems.** *Illinois. State Water Survey Div., Bulletin*, No. 41:235–239, 1952. **DWB**—Brief discussion of the specific problems confronting the Illinois State Water Survey in using radar for quantitative rainfall measurements. How the freezing levels and beam width affect the useful radar range is shown graphically. Values, calculated from the intensities and storm area as observed on isohyetal maps from an eight-mile square rain gage network are tabulated and the limits of maximum accuracy to expect of a radar to determine rainfall intensities are indicated. Scope photos of 584, APQ-13 and APS-15 radars included. (*Same item as* 4.7–24, July 1953, *MAB.*) *Subject Headings:* **1. Radar rainfall measurements 2. Rainfall intensities.**—*W.N.*

6G–72 551.501.83:551.551:551.557

Fleisher, Aaron (*Mass. Inst. of Technology, Cambridge, Mass.*), **The use and limitations of rasaph.** *Illinois. State Water Survey Division, Bulletin*, No. 41:263–267, 1952. **DWB**—The spectrum of the returned signal fluctuations is a datum from which can be obtained a measure of gustiness in the free atmosphere. If it is to be measured with a filter, the sampling interval should be long enough to establish the steady state response of the filter. *Subject Headings:* **1. High level turbulence measurement 2. Radar analysis of gustiness.**—*Author's abstract.*

6G–73 551.576.11:551.501.81

Foster, Hal, **A radar observation of Bénard cells.** *Journal of Meteorology*, 9(6):437–439, Dec. 1952. 2 figs., 3 refs. **MH-BH**—PPI photographs at Cambridge, Mass., March 24, 1952, show a fine cellular structure below nimbostratus. This is attributed to a cellular circulation below an inversion. (*Same item as* 4.6–169, June 1953, *MAB.*) *Subject Headings:* **1. Cloud structure 2. Radar observations.**—*C.E.P.B.*

6G–74 551.501.81:551.509

§Foster, Hal, **Use of radar in weather forecasting with particular reference to radar set AN/CPS-9.** Massachusetts Institute of Technology. Dept. of Meteorology. Weather Radar Research, Contract DA-36-039-sc-124, Technical Report, No. 20, (1952). 64 p. 72 figs. (incl. photos). **DWB**—First part of this manual is devoted to description of the specifically designed AN/CPS-9 radar as a meteorological tool. Next part takes up radar as used in forecasting. Interpretation of echoes by qualified meteorologist should give reasonably accurate local forecast for periods up to 6 hrs. Excellent PPI representation of several meteorological phenomena are given. The third and last part is a sample analysis of the storm in Boston, Mass., Nov. 14, 1951 as seen on the radar set and explained in correlation with the synoptic situation mapped. *Subject Headings:* **1. Radar weather forecasting 2. AN/CPS-9 radar.**—*W.N.*

6G–75 551.501.81:551.576.11 629.13

Frost, R., **Meteorological report on the Singapore cloud detection trials.** *Great Britain. Meteorological Research Committee, M.R.P.* 757, Sept. 23, 1952. 16 p. 3 figs., 9 tables, 14 refs. Mimeo. **DWB**—Runs were made towards and through Cu and CuNb by aircraft with 3 cm radar. Heights

of Cu giving radar echo 13–33,000 ft, many below freezing level; CuNb 29–55,000 ft. At transition level temperature is −30 to −35°C. Mean diameter, visual, 6 mi, radar 4½. Occasions of hail and of snow tabulated; risk of severe icing small. Lightning occurred only with cloud top above 35,000 ft. Up- and down-drafts tabulated; maximum updraft 53 ft/sec. Gust accelerations summarized in relation to position in cloud. Practically all turbulence can be avoided by avoiding radar response areas by a mile. (*Same item as* 4.9–32, Sept. 1953, *MAB.*) *Subject Headings:* **1. Cumulonimbus clouds 2. Radar observations 3. Flight procedure 4. Singapore.**—*C.E.P.B.*

6G–76 551.501.81:551.576.11:551.594.7

Gould, William B. (*Evans Signal Lab., Belmar, N. J.*), **Cloud detection by radar.** *Illinois. State Water Survey Div., Bulletin*, No. 41:209–215, 1952. **DWB** Brief text accompanied by excellent photos of cloud base and top records taken from the A scope of a 1 cm radar set operating vertically, and from a "novel" gadget: a more or less conventional facsimile recorder, modified to the speed of 12 in/hr. The discussion largely deals with the problems of "angels." (*Same item as* 4.7–25, July 1953, *MAB.*) *Subject Headings:* **1. Radar cloud detection 2. Angels.**—*W.N.*

6G–77 551.515.23

Hurricane hunters. *The Lamp*, N. Y., 34(3):15–17, Sept. 1952. illus. **DWB**—The 53rd Air Reconnaissance Squadron, based at Miami, is the subject of a vivid narration in which the squadron's activities in exploring a hurricane from Sept. 11 to Sept. 18, 1952 are described in some detail. The development of the hurricane itself is also dramatically depicted. A sample radarscope photograph showing the eye of a hurricane is presented. (*Same item as* 4.7–87, July 1953, *MAB.*) *Subject Headings:* **1. Hurricane tracking 2. Radar storm detection 3. Airplane weather reconnaissance.**—*G.T.*

6G–78 551.501.83

International Civil Aviation Organization, **Radio-electric storm detection (sferics).** *International Civil Aviation Organization, Montreal, Circular* 22-AN/19, Feb. 1952. 42 p. 13 figs., map, 53 refs. **DWB**—Physical properties of lightning discharges (which have been found to be the main source of atmospherics) and of sferics and their propagation are described and illustrated in schematic drawings. Wattson-Watt cathode-ray oscilloscope (used in Britain), Lugeon recording apparatus (used in Switzerland and France) and a uni-directional cathode-ray direction finder developed in Sweden are described and shown in photographs and diagrams. Locations of sferics installations in 11 countries are listed. Practical usefulness of radio-electric storm detection is discussed briefly. Results of ICAO meetings (held at various places between 1947 and 1950) in which requirements for information on sferics were investigated, are summed up. This circular was issued in English, French and Spanish. (*Same item as* 4.2–33, Feb. 1953, *MAB.*) *Subject Headings:* **1. Sferics 2. Radar storm detection 3. Cathode-ray oscillographs.**—*G.T.*

6G–79 551.501.81:621.396.9

Institute of Navigation, London, **The use of radar at sea;** ed. by F. J. Wylie; foreword by Sir Robert Watson-Watt. London, Hollis and Carter, 1952. 279 p. 161 figs. (incl. numerous photos), tables. **DLC**—The various aspects of the subject are covered in 15 chapters beginning with a general explanation of the principles of radio echoes and characteristics of radar. The existing radar equipment is discussed with the emphasis on function rather than construction in order to give a complete understanding of operational use (and limitations) including interpretation of PPI displays and maintenance of the sets. The radio meteorological topics discussed include standard and nonstandard propagation, sub- and super-refraction, attenuation by atmospheric gases, fog, rain, hail and snow. Echoes as affected by weather and some peculiar echoes such as those from sea ice are discussed. The appendices include a table of echo-recognition, some constants, formulas, useful data and a brief glossary of technical terms. The index is arranged by main subjects under which related subjects are found. *Subject Headings:* **1. Radar echoes 2. Radar equipment. I. Wylie, F. J.** (*ed.*).—*W.N.*

6G–80 551.501.81:551.577.21

Jones, Douglas M. A. and Hiser, Homer W. (*Ill. St. Water Survey*), **Measurement of point and areal rainfall by radar.** *Illinois. State Water Survey Div., Bulletin*, No. 41:241–254, 1952. **DWB**—During the 1951 thunderstorm season, the Illinois State Water Survey operated a TPL-1, 10 cm searchlight tracking radar and two APS-15A, 3 cm air-borne radars. Thirty-four Bendix-Friez Dual Traverse Model 775-BS rain gages were used in the correlation studies under discussion. The results are shown by means of isohyetal charts and curves showing power-range factor vs. rainfall intensity. (*Same item as* 4.7–26, July 1953, *MAB.*) *Subject Headings:* **1. Radar rainfall measurements 2. Rainfall intensities.**—*W.N.*

6G–81 551.594.7:06 551.577.1:621.396.9

Jones, R. F., **Application of radar to meteorology. Conference in Montreal.** *Nature*, London, 170(4337):1004–1005, Dec. 13, 1952. **DWB**—Account of conference at McGill Univ., Sept. 15–17, 1952. Sec. A, **Precipitation mechanisms,** included coalescence of liquid drops especially by turbulence, turbulence affecting aircraft, and snow generation; Sec. B described **Cloud observations and cloud radar problems;** Sec. C, the use of airborne radar to increase passenger safety and comfort; Sec. D included two papers on **Rain measurements** by radar; Sec. E, **Instruments** for raindrop size and distribution and Sec. F **Scattering in the atmosphere** (including "angels"). The final session discussed **Fluctuating signals** and their bearing on turbulence. (*Same item as* 4.5–240, May 1953, *MAB.*) *Subject Headings:* **1. Radar meteorology 2. Rain formation 3. Conferences.**—*C.E.P.B.*

6G–82 551.511:551.501.81

Jones, R. F., **Radar evidence of the formation of Bénard convection cells.** *Meteorological Magazine*, London, 81(959):152–153, May **1952.** 2 photos. **MH-BH**—On Dec. 31, 1951, radar photographs from East Hill, Bedfordshire, showed many small cells 1750 ft deep with a tendency to alignment. Attributed to cooling of top of cloud by radiation after sunset; 2°F would suffice. (*Same item as* 3.9–93, Sept. 1952, *MAB.*) *Subject Headings:* **1. Bénard cells 2. Radar observations.** —*C.E.P.B.*

6G–83 551.508.81:551.515.23

Jorgensen, Roy C., **New developments in using radar for hurricane tracking.** *Illinois. State Water Survey Div., Bulletin*, No. 41:301, **1952. DWB**—Brief note asking for cooperation from everyone operating radar for hurricane detection. Exchange of ideas and photographs and visiting each other's stations might assist in combatting the hurricanes. (*Same item as* 6.4–79, April 1955, *MAB.*) *Subject Headings:* **1. Hurricane tracking 2. Radar storm detection.**—*W.N.*

6G–84 551.507.352:551.508.85:551.508.765

Katz, Isadore, **Naval Research Laboratory's R5D.** *Illinois. State Water Survey Div., Bulletin*, No. 41, **1952.** p. 199–203. **DWB**—General description of the meteorological and radio instruments and their arrangement for efficient operation aboard a R5D airplane modified for the purpose of taking simultaneous measurements of electromagnetic signals and weather phenomena. The disdrometer and the total water collector are described in some detail. (*Same item as* 4.6–43, June 1953, *MAB.*) *Subject Headings:* **1. Radar weather instruments 2. Disdrometers 3. Airborne instruments.**—*W.N.*

6G–85 551.574.1:551.501.8

Kerker, Milton (*Clarkson Coll. of Tech., Potsdam, N. Y.*), **Centimetric scattering.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 13:11–31, May **1952.** Discussion, p. 15, 18–19, 23–29. 5 figs., 3 tables, 21 refs. **DWB**—Theory and experimental techniques of the study of aerosols, clouds and atmospheric precipitation by means of the scattering of electromagnetic waves are discussed. Special consideration is given to the problems of snow versus rain scatter and to the "bright band" phenomenon. *Subject Headings:* **1. Aerosols 2. Electromagnetic wave scattering 3. Bright band echoes. I. Colloquium on Microwave Meteorology. Aerosols and Cloud Physics.**—*G.T.*

6G–86 551.501.81:551.57

Labrum, N. R. (*Div. of Radiophysics, Commonwealth Sci. and Indust. Res. Organization, Australia*), **The scattering of radio waves by meteorological particles.** *Journal of Applied Physics*, Menasha, Wisc., 23(12):1324–1330, Dec. **1952.** 6 figs., foot-refs., eqs. **DWB**—The scattering of electromagnetic waves by clouds of small spheroidal obstacles is considered from a theoretical standpoint. Numerical data are obtained for the case of clouds composed of partly melted ice particles. These results are applied to the interpretation of "bright band" radar echoes from meteorological formations. It is also shown that these echoes may contain a component with polarization at right angles to that of the transmitted beam. It is suggested that this property could be utilized in certain cases to provide additional information as to the nature of the scattering particles. *Subject Headings:* **1. Bright band echoes 2. Radar analysis of precipitation.**—*Author's abstract.*

6G–87 551.501.81:551.577

Labrum, N. R. (*Div. of Radiophysics, CSIRO, Sydney, Australia*), **Some experiments on centimeter-wavelength scattering by small obstacles.** *Journal of Applied Physics*, Menasha, Wisc., 23(12):1320–1323, Dec. **1952.** 4 figs., foot-refs., 2 eqs. **DWB**—The scattering of electromagnetic waves by small obstacles has been measured in several cases which are of interest in connection with the interpretation of radar echoes from rain and cloud formations. The measurements were made

at a frequency of 3000 Mc/sec by an impedance-bridge technique, the specimens being contained in a wave guide. The results verify the theoretical relationship between the size of the scatterer and the intensity of the backscattered wave. Observations have also been made of the variation in scattering during the melting of an obstacle initially composed of ice. In this case, it was not possible to simulate exactly the conditions of large-scale meteorological phenomena; however, the experiments demonstrate quantitatively that, as had been predicted, the power backscattered from an initially nonspherical ice particle passes through a maximum value during the transition to a water drop. *Subject Heading:* **1. Radar precipitation echoes.**—*Author's abstract.*

6G–88 551.501.81

§Latour, M. H., **Scattering and attenuation of microwave signals by hydrometeors.** Florida. Univ. at Gainesville. Engineering and Industrial Experiment Station, Contract AF 33(038)-14944, Monthly Progress Report, No. 11, Aug. 15, 1951—No. 22, July 15, 1952. 12 pieces bound together with title: **Annual Report, July 1, 1951–June 30, 1952.** numerous figs. (many fold.). **DWB**—Complete account of organization of program and details of the maintenance of equipment, administration, diagrams and photographs of installations and grounds; and numerous radar scope photographs, etc., made at the Univ. of Florida with a modified AN/APS-2F radar obtained from the Tampa Weather Bureau Office. The radar installed on a new 120 ft tower at Gainesville, was used to obtain 20,000 radar photographs of fronts, squall lines, thunderstorms, showers, hurricanes, lightning and anomalous propagation conditions. Many cases are analyzed and presented in connection with synoptic charts and description of detailed weather conditions. The analyses cover all seasons (Aug. 1951–June 1952). *Subject Headings:* **1. Radar storm detection 2. Radar scope photography 3. Radar weather equipment.**—*M.R.*

6G–89 551.501.81:551.577

Lhermitte, Roger, **Les "bandes supérieures" dans la structure verticale des échos de pluie.** The "upper bands" in the vertical structure of rain echoes.] *Académie des Sciences, Paris, Comptes Rendus*, 235(22):1414–1416, Dec. 1, 1952. fig., 3 refs. **DWB**—Observations made at Magny-les-Hameaux with 2 radars operating simultaneously at 3.2 cm wave length, give the horizontal and the vertical structure of precipitation echoes and their speed of movement in both planes. Three types of "upper bands" are described and illustrated, and formulas derived which agree with their observed speed of fall, indicating that they are produced by snowflakes fusing with raindrops. (*Same item as* 5.3–44, March 1954, *MAB.*) *Subject Headings:* **1. Bright band echoes 2. Upper band radar echoes 3. Radar precipitation echoes.**—*M.R.*

6G–90 551.501.89:551.578.41

Marshall, John Stewart and Gunn, K. L. S. (*McGill Univ., Montreal*), **Measurement of snow parameters by radar.** *Journal of Meteorology*, 9(5):322–327, Oct. **1952.** 3 figs., table, 12 refs., 12 eqs. **MH-BH**—Back scattering by small nonspherical particles of uncertain density is assumed proportional to $|K_i|^2ZS$, where K_i is dielectric factor and $Z=D_i^6$(D_i=diameter) of equivalent sphere of unit density. Using LANGILLE and THAIN's simultaneous data of Z (by radar) and R (rate of snowfall, mm/hr) fairly good correlations were found between log Z and log R (roughly $Z=200R^{1.6}$, similar to values obtained for rain). It is inferred that bright band echo is due to increased effective particle mass caused by aggregation. The (exponential) size distribution of snow particles is comparable with that of raindrops (MARSHALL and PALMER). (*Same item as* 4.2–35, Feb. 1953, *MAB.*) *Subject Headings:* **1. Radar analysis of precipitation 2. Snow structure.** —*C.E.P.B.*

6G–91 551.594.7:621.396.029.6

Marshall, John Stewart; East, T. W. R. and Gunn, K. L. S., **Microwave properties of precipitation particles.** McGill University. Macdonald Physics Laboratory, Stormy Weather Research Group, Contract AF 19(122)-217, Scientific Report MW-7, July **1952.** 40 figs., table, refs. p. 39–40, eqs. **DWB**—This study goes in some detail into the effect of shape and composition of the various precipitation particles. Not only is the sphere, in the steps ranging from: 1) all ice to 2) ice coated with water and into 3) all water, discussed but also assemblies of spheres, rain, nonspherical and coated particles (flakes and crystals) are considered. The results are discussed and the data are presented in tables and curves featuring individual and comparative values. Further experiments as to the problem of the "bright band" are suggested. (*Same item as* 4.11–286, Nov. 1953, *MAB.*) *Subject Headings:* **1. Microwave propagation 2. Precipitation 3. Bright band echoes.**—*W.N.*

6G–92 551.501.8:621.396.826

Marshall, J. S. and Hitschfeld, Walter (*McGill Univ. Montreal*), **Reduction of fluctuations in echoes from randomly distributed scatters.** *Illinois. State Water Survey Division, Bulletin*, No 41, 1952. p. 255–262. **DWB**—An elaborate mathematical treatment of radar displays of A-scopes

or brightness modulated presentations by means of probability distribution. Interpretation, giving the mean value of the received intensity, can easily be attained if the presentation is either linear or logarithmic. *Subject Headings:* **1. Radar techniques 2. Random radar echoes.**—*W.N.*

6G–93 551.551:551.509.59:551.501.8

Merewether, A. F. and White, F. C., **Storm and clear air turbulence: an analysis of the problem and a search for solution.** *Institute of the Aeronautical Sciences, New York, Preprint,* No. 361, Jan. 28–Feb. 1, **1952.** 10 p. 6 figs., 10 refs. Also in: *Index Aeronauticus,* London, 8(7):48, July **1952. DWB**—Improved radar will aid greatly in the forecasting and avoidance by aircraft of turbulence in clouds and storms. Attempts at detecting and forecasting clear air high altitude turbulence are being made with the "gustsond," a vibrating arm type instrument which transmits the fluctuation of the arm by radio. (*Same item as* 3K–199, Nov. 1952, *MAB.*) *Subject Headings:* **1. Thunderstorm turbulence 2. Radar storm detection.**—*From authors' abstract.*

6G–94 551.501.81:551.515.4:551.577

Reynolds, S. E. and Braham, Roscoe, (*New Mexico Inst. of Mining and Technology, Socorro*), **Significance of the initial radar echo.** *American Meteorological Society, Bulletin,* 33(3):123, March **1952.** 4 refs. **MH-BH**—The initial radar echo in thunderstorms was observed first at −10°C in New Mexico and at −2°C in Ohio. Since the ice crystals were small and since strong updrafts appear to be necessary for producing the high liquid water content essential for the rapid development of precipitation it can be assumed that the particles were rising. According to BERGERON, mechanism for precipitation development should not be expected to appear first in the region of the cloud warmer than −5°C. There is then a possibility for the existence of different precipitation processes in different geographic areas. (*Same item as* 4.9–33, Sept. 1953, *MAB.*) *Subject Headings:* **1. Radar storm detection 2. Radar precipitation echoes 3. Thunderstorm formation 4. New Mexico 5. Ohio.**—*I.L.D.*

6G–95 551.578.11:551.594.7:621.396.029.6

Rigby, E. Caroline and Marshall, J. S., **Modification of rain with distance fallen.** McGill Univ. Macdonald Physics Laboratory. Stormy Weather Research Group, Contract AF 19(122)-217, Scientific Report MW-3, Jan. **1952.** 51 p. figs., tables, refs., eqs. **DWB**—The radar microwave scattering from rain is most dependent on the size distribution of raindrops. The modification of size distribution is investigated in a detailed manner under three headings: a) accretion of clouds by raindrops, b) coalescence between raindrops and c) evaporation of raindrops. All these processes have considerable modifying effects on microwaves, but are not sufficiently powerful to be basic factors in determining the nature of the drop size distribution. (*Same item as* 4.11–226, Nov. 1953, *MAB.*) *Subject Headings:* **1. Raindrop size distribution 2. Microwaves 3. Radar rain recording 4. Cloud physics.**—*A.A.*

6G–96 551.501.8:551.556:551.465(449.49)

Rouch, J. and Broc, J., **Utilisation du radar du Musée Océanographique de Monaco pour des mesures de météorologie nautique.** [Use of radar at the Oceanographic Museum of Monaco for marine meteorological measurements.] *Geofisica Pura e Applicata,* 21:39–40, **1952.** English summary p. 39. **MH-BH**—Since 1949 radar has been used extensively at the Musée Océanographique in Monaco to study clouds, atmospheric vapor, vertical motion, and turbulence. Radar echoes from the sea surface taken in conjunction with other observations facilitate the study of the relationship between wind and state of the sea. (*Same item as* 3.11–34, Nov. 1952, *MAB.*) *Subject Headings:* **1. Marine meteorology 2. Radar echoes from sea 3. Radar meteorology 4. Wind waves 5. Ocean-atmosphere interaction 6. Monaco.**—*M. P. Kramer.*

6G–97 551.501.81:551.594.7

Vassy, Arlette and Vassy, Étienne, **Interpretation d'un type particular d'écho de radar.** [Interpretation of a special type of radar echo.] *Académie des Sciences, Paris, Comptes Rendus,* 235(20): 1240–1242, Nov. 17, **1952.** 2 refs. **DWB**—The peculiar radar echo from a cloudless sky (first observed by J. BROCH on a 3.2 cm radar over the ocean) was again observed in the summer of 1952. This paper is an attempt to interpret the phenomenon as a coincidence of meteorological factors favoring superrefraction. (*Same item as* 5.10–30, Oct. 1954, *MAB.*) *Subject Headings:* **1. Angels 2. Radar echoes from cloudless sky 3. Superrefraction. I. Broc, J.**—*W.N.*

6G–98 551.594.7:621,396.029.6

†Vysokovskiĭ, D. M., **Rasseivanie i pogloshchenenie mikroradiovoln v atmosfernykh obrazovaniiakd (dozhd', sneg, oblachnost', tuman) i radiolokatsiia.** [Scattering and absorption of microradio waves in atmospheric formations (rain, snow, cloudiness, fog) and radio location.] *Uspekhi Fizicheskikh Nauk,* Moscow, 47(3):389–444, July **1952.** 15 figs., 9 tables, 32 refs., 112 eqs. **DLC**—

A highly theoretical paper in which the author presents a survey of the main results of theoretical and experimental investigations of the scattering and absorption of microradio by macroscopic particles of spheric form and on the application of radio-location for the study of atmospheric formations. The author takes up successively the following questions: 1) the theory of scattering and absorption of microradio waves by spherical particles; 2) the amplitude of scattering a_n^s and b_n^s; 3) the fading of microradio waves on suspension of spherical water drops in the atmosphere; 4) a scattering of microradio waves by spherical water drops; 5) reverse (radio-locational) scattering; 6) some physical data on atmospheric formations; 7) the theory of radio-location of atmospheric formations; 8) methods and results of an investigation of atmospheric formations by means of radio-location. (*Same item as* 4.10–268, Oct. 1953, *MAB.*) *Subject Headings:* **1. Microwave scattering 2. Microwave absorption 3. Hydrometeors.**—*A.M.P.*

6G–99 551.574.1:551.577.11:551.501.81

Wexler, Raymond, **Precipitation growth in stratiform clouds.** *Royal Meteorological Society, Quarterly Journal*, 78(337):363–371, July **1952.** 2 figs., 2 tables, 19 refs., 11 eqs. **DWB**—The paper interprets the growth of ice crystals in stratiform clouds from radar observations by comparison with theoretical growth rates, using circular disks as models, and two cloud models. The masses and terminal velocities of ice crystals originating at 3 km in a water-saturated cloud are computed for different levels and compared with radar signal intensity. It is found that no liquid water exists at levels above −5°C; below the −3°C level coalescence of ice crystals occurs and a "coalescence function" is calculated as the ratio of the radar echo from snowflakes to that from individual crystals. (*Same item as* 3.11–183, Nov. 1952, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Precipitation formation 3. Radar precipitation echoes.**—*C.E.P.B.*

6G–100 551.574.1:551.501.81

Wexler, Raymond and Boucher, Roland J., **Theoretical studies related to the growth of precipitation particles, and empirical studies and statistical analyses of particle size distributions in rain and clouds and their relationship to radar reflectivity.** Mount Washington Observatory, Contribution to the theory of the constitution of clouds, Contract AF 19(122)-399, Final Report, July 31, **1952.** 4 p. refs. **DWB**—This report consists of 6 papers prepared under the above quoted contract during the period Oct. 1950–July 1952. The papers appeared in Quarterly Progress Reports and in Scientific Reports of the contractor. The subjects covered are: the effect of coalescence on drop size distribution, radar echoes from thunderstorms, heat balance of growing ice particles, nylon screen for measuring drop size distribution and liquid water content. (*Same item as* 4.8–174, Aug. 1953, *MAB.*) *Subject Headings:* **1. Drop size distribution 2. Drop growth 3. Radar analysis of precipitation 4. Coalescence 5. Liquid water content of clouds.**—*G.T.*

6G–101 551.501.81:551.574.1:551.576.11

Wexler, R., **Theory of the radar upper band.** *Royal Meteorological Society, Quarterly Journal*, 78(337):372–376, July **1952.** 2 tables, 4 refs., 10 eqs. **DWB**—The upper radar band described by Bowen (*see item* 2.11–142, Nov. 1951, *MAB*) is attributed to the growth of a layer of tabular crystals into graupel, which depletes the liquid water content below a critical value. The necessary conditions are described. (*Same item as* 3.10–36, Oct. 1952, *MAB.*) *Subject Headings:* **1. Bright band echoes 2. Radar analysis of precipitation.**—*C.E.P.B.*

1953

6G–102 551.501.8:551.524.4:551.543

Aden, Arthur L., **Feasibility of detecting atmospheric inversions by electromagnetic probing.** *U. S. Air Force. Cambridge Research Center, Air Force Surveys in Geophysics*, No. 34, March **1953.** 9 p. 19 eqs., 7 refs. **DWB**—An outline is given of the theory of standard and nonstandard propagation characteristics of electromagnetic waves, dependent on discontinuities of the refractive index. Vertical incidence atmospheric probing with standard *L*-band radar equipment should not give reflections from temperature and humidity inversions. There is only a remote possibility that proper equipment could be developed. *Subject Headings:* **1. Radar observation of inversions 2. Refractive index discontinuities.**—*A.A.*

6G–103 551.501.8:551.515.4

Airborne radar: flight operations round table. *Skyways*, N. Y., 12(5):20–23, 36–50, May **1953.** illus. **DWB**—As a result of this round table discussion, in which J. J. George of Eastern Airlines and A. J. Merewether of American Airlines took part as meteorologists, it was concluded that the most useful function of airborne radar is its ability to detect areas of rain and, incidentally, areas of severe turbulence, icing or thunderstorm activity while flying in storm areas, thus giving the pilot confidence and often enabling him to avoid such areas. The ability to anticipate terrain obstructions

on the flight path and navigational use are of lesser importance. If the radar is to detect rain areas it must be of a different frequency than it would be if its use is to get a clear picture of terrain or of other aircraft obviously without interference by rain areas. The frequencies used are 3 cm for rain, 10 cm for terrain warning (or even 10 m). (*Same item as* 5.3-35, March 1954, *MAB.*) *Subject Headings:* **1. Air-borne weather radar 2. Radar thunderstorm detection 3. Aeronautical meteorology. I. George, J. J. II. Merewether, A. F.**—*M.R.*

6G–104 551.591.1:551.576.1 551.594.7

Atlas, David and Bartnoff, Shepard, **Cloud visibility, radar reflectivity, and drop-size distribution.** *Journal of Meteorology*, 10(2):143–148, April **1953.** 2 figs., 5 tables, 11 refs., 10 eqs. **MH-BH**—In W. TRABERT's 1901 visibility equation $V = (C\rho\bar{r})/W$, where V is in meters, $\bar{r}$ is mean drop radius (microns), W liquid water content in g/m³ and ρ density of scattering material, C has preferred values of 3.3–4.8 for different cloud types. A better expression is $V = (K\rho d_0)/W$, where d_0 is median drop diameter and K, about 1.2, is nearly independent of drop-size spectrum in natural clouds. The radar-reflectivity factor Z is given by $Z = (6/\pi)G(n)d_0{}^3(W/\rho)\times 10^{-6}$, where $G(n) = 1.35$. (*Same item as* 4.8–263, Aug. 1953, *MAB.*) *Subject Headings:* **1. Visibility in clouds 2. Radar meteorology.**—*C.E.P.B.*

6G–105 551.501.81:551.553.11

Atlas, David; Paulsen, W. H.; Donaldson, R. J.; Chmela, A. C. and Plank, V. G. (*all: A. F. Cambridge Res. Center*), **Observation of the sea breeze by 1.25 cm. radar.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings.** [v. 1]: XI-6, pub. **1953.** 5 p. 3 figs., 3 refs., 2 eqs.) **DLC, DWB**—The sea breeze front recorded on the 1.25 cm radar at Round Hill Field Station (near New Bedford, Mass.) at 12:05 on June 15, 1953 as a series of waves of precipitation-like echoes (angels) is described in detail as it approached and passed the station. It evidently was in the form of a square wave (at least up to 144 feet) and was detectable at sea approaching at about 9 mph. Bubbles extended to 250 ft. Calculations from reflectivity of the discontinuity in the refractive index gave a layer thickness at the inversion of only 10^{-2} cm, and on June 24 a smaller one was only 0.6×10^{-2} cm thick or else the equation (Swingle 1950) is wrong. *Subject Headings:* **1. Radar observations 2. Sea breeze front 3. Angels 4. Refractive index discontinuities.**—*M.R.*

6G–106 551.501.81:551.577

Atlas, David; Kerker, Milton and Hitschfeld, Walter, **Scattering and attenuation by non-spherical atmospheric particles.** *Journal of Atmospheric and Terrestrial Physics*, 3(2):180–119, Feb. **1953.** 6 figs., table, 9 refs., 12 eqs. **DWB**—R. GANS' theory of scattering and absorption of electro-magnetic radiation by oblate and prolate spheroids is used to calculate back-scatter and attenuation by atmospheric particles. For randomly oriented non-spherical water particles these exceed those of spheres of the same volume. Back-scatter and attenuation by oriented particles depend on polarization and angle of incidence of radiation. Snow scatters like spheres of equal volume. (*Same item as* 4.9–31, Sept. 1953, *MAB.*) *Subject Heading:* **1. Radar precipitation echoes**—*C.E.P.B.*

6G–107 551.501.81:551.577.3

Austin, Pauline M. (*M.I.T.*), **Information obtainable from quantitative observations of radar echoes from precipitation.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** [v. 1]:VI-1, pub. **1953.** 8 p. 6 figs.) **DLC, DWB**—Quantitative measurements in field of radar meteorology have lagged behind theoretical work and general observations on PPI and RHI scopes. The R-scope was used for first attempts at quantitative measurements, by attempting to match the vertical displacement which is proportional to the signal intensity with a known intensity signal. Theory of scattering and absorption or attentuation from a single rain or snow flake or from a large number of such, and measurement of average signal intensity, of rainfall intensity, and of rainfall over an area, applications to study of cloud and precipitation physics and, finally, information that can be obtained from measurements of this type (average signal intensity and autocorrelation function) are discussed. *Subject Headings:* **1. Radar precipitation intensity measurement 2. Signal intensity measurement 3. Radarscope records of precipitation quantity.**—*M.R.*

6G–108 551.515.2(261):551.501.8

Barlow, E. W., **Notes on hurricanes Baker and Charlie, western North Atlantic Ocean, September 1952.** *Marine Observer*, 23(162):209–213, Oct. **1953.** 5 figs. **DWB**—Tracks of "Baker," Aug. 31–Sept. 8, 1952 and "Charlie," Sept. 23–30, 1952, are shown and weather reported by ship tabulated. Sketches of radar screen of M.V. "Samanco" show remarkable spiral structure. The eye of the storm passed over the ship. (*Same item as* 5.6–129, June 1954, *MAB.*) *Subject Headings*

1. Radar storm detection 2. Hurricane "Baker" (1952) 3. Hurricane "Charlie" (1952) 4. North Atlantic Ocean.—*C.E.P.B.*

6G–109 551.501.8:551.558

Barratt, P. and Browne, Ian C., **A new method for measuring vertical air currents.** *Royal Meteorological Society, Quarterly Journal*, 79(342):550, Oct. **1953.** 4 refs. **DWB**—A radar beam directed vertically on a cloud is split and part of it deflected on to a suitable ground target and the frequencies of the two echoes are compared. The shift of frequency of the cloud echo gives the velocity of cloud droplets relative to the radar beam. Preliminary observations in a shower at Cambridge gave a downdraught of 2 m/sec. (*Same item as* 5.3–36, March 1954, *MAB.*) *Subject Headings:* **1. Radar wind measurement 2. Vertical velocities.**—*C.E.P.B.*

6G–110 551.501.81:551.576.11

Battan, Louis J., **Duration of convective radar clouds.** *American Meteorological Society, Bulletin*, 34(5):227–228, May **1953. DWB**—The duration of individual convective cells was studied on the basis of a group of individual echoes whose development and complete history could be followed. The data were taken from photographs of PPI scopes of a high powered *S*-band search radar set in southwestern Ohio used by the Thunderstorm Project. Frequency distribution of the duration of the echo and time required for it to reach maximum size for different maximum sizes of radar clouds are given in tables. For echoes smaller than 3 in. the duration increases with size. The maximum duration of radar cells was between 40 and 45 min. The mean time required for an echo to attain maximum size is 10 min and the mode 8 min. (*Same item as* 5.11–25, Nov. 1954, *MAB.*) *Subject Headings:* **1. Convective clouds 2. Radar echoes from clouds.**—*I.L.D.*

6G–111 551.501.81:551.515

Beliakov, M., **Radiolokatsionnaia tekhnika v meteorologii.** [Radio location technique in meteorology.] *Radio*, Moscow, No. 1:17–19, Jan. **1953.** 6 figs. **DLC**—Describes and illustrates modern methods of locating pilot balloons, radiosondes, clouds, rain, snow, ice storm and hurricane areas by radio and radar. Schematic diagrams show geometry of wind calculation from pilot balloons. Radar photographs of storm and hurricanes are also shown. *Subject Headings:* **1. Radio wind soundings 2. Radar storm detection.**—*M.R.*

6G–112 551.578.11

Blanchard, Duncan C., **Raindrop size-distribution in Hawaiian rains.** *Journal of Meteorology*, 10(6):457–473, Dec. **1953.** 13 figs., 2 tables, 36 refs. Also his: **Raindrop size distribution and associated phenomena in Hawaiian rains.** Woods Hole Oceanographic Institution, Contract Nonr-798(00) (Nr-085-001), Technical Report, No. 4, Dec. **1952.** 21 p. figs., tables, refs. **MH-BH, DWB**—Filter paper samples of drop-size distribution in orographic rains from non-freezing clouds at cloud base or within the cloud gave narrow distributions, largest drops rarely exceeding 2 mm diameter and drops >0.5 mm often exceeding 25,000/m³. These give low values of median drop diameter and radar reflectivity but high liquid-water content. Regression equations for median diameter, water content, radar reflectivity and rate of rain are obtained for different situations. (*Same item as* 5.7–159, July 1954, *MAB.*) *Subject Headings:* **1. Raindrop size distribution 2. Hawaiian Islands.**—*C.E.P.B.*

6G–113 551.501.8:535.314

Broc, Jean; Vassy, Arlette and Vassy, Étienne, **Échos anormaux observés avec le radar du Musée Océanographique de Monaco.** [Abnormal echoes observed by radar at the Oceanographic Institute of Monaco.] *Geofisica Pura e Applicata*, 25:71–82, **1953.** 17 figs., 4 refs. **MH-BH**—Using a radar (3.2 cm wave length) with a horizontal beam having a 3° aperture cone, the authors have observed characteristic echoes above the sea surface, coming from ranges between 5 and 35 nautical mi. These echoes have the form of sinuous ribbons or of clusters and last from a few minutes to several hours. They are more frequent during summer and have never been observed in winter. These echoes are accompanied always by sea echoes from nearby waves. Nothing is observed beyond these echoes. They are attributed to supranormal refraction of the hertzian beam together with reflection on the sea waves. Temperature, pressure and humidity conditions bringing about a vertical distribution of the refraction index associated with superrefraction are discussed and the law of distribution leading to a focusing of the beam observed occasionally is considered. *Subject Headings:* **1. Radar echoes from inversions 2. Refraction phenomena 3. Angels 4. Monaco.**—*I.L.D.*

6G–114 551.501.81:551.524.7:551.571.7

Browne, Ian C., **Radar echoes at vertical incidence from a horizontally stratified atmosphere.** *Royal Meteorological Society, Quarterly Journal*, 79(339):157–160, Jan. **1953.** 2 figs. 8 refs., 4 eqs.

DWB—On July 12, 1949, on 3.2 cm radar at Cambridge, England, an echo (angel) was received from a horizontal layer 300 ft thick at 4560 ft, attributed to a humidity discontinuity of 40% at an anticyclonic inversion. (*Same item as* 4.7–22, July 1953, *MAB.*) *Subject Headings:* **1. Radar echoes from inversions 2. Upper air humidity 3. Cambridge, England.**—*C.E.P.B.*

6G–115 551.594.7:06

Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings.** [v. 1.] Conference sponsored by The American Meteorological Society; The Institute of Radio Engineers; The Radar Weather Conference; The International Scientific Radio Union; The Joint Commission on Radio Meteorology of the International Scientific Unions. Austin, Bureau of Engineering Research, Univ. of Texas, **1953.** Each section renumbered. Pref. "Vol. 2 to be entitled Supplement to the Proceedings to be published within a month or so of the conference." **DWB**—Short versions or summaries of 61 papers on Tropospheric Propagation; Refractive Index; Atmospheric Scattering and Turbulence; Thunderstorm and Tornado Atmospherics; Cloud and Precipitation Physics and use of Weather Radar, as presented at the sessions on those topics during the Conference on Radio Meteorology, Nov. 9–12, 1953 at Austin, Texas. The remaining papers and supplementary material, discussions, etc. will comprise the second volume of the two. Papers abstracted separately in this bibliography. (*Same item as* 5.7–3, July 1954, *MAB.*) *Subject Headings:* **1. Radio meteorology conferences 2. Radio meteorology 3. Austin, Texas.**—*M.R.*

6G–116 551.501.81:551.577(94)

Day, G. A., **Radar observations of rain at Sydney, New South Wales.** *Australian Journal of Physics*, 6(2):229–239, June **1953.** 2 figs., table, 7 plates, 10 refs. **DWB**—The radar echoes received from rain during systematic observations carried out from Jan. 1950 to Jan. 1951 at the Radiophysics Laboratory, Sydney, N.S.W., are illustrated and described. Examples of echoes from melting and upper bands, nonfreezing and frontal showers, thunderstorms, and echo masses are shown by vertical cross sections of the atmosphere through the point of observation. Correlation between the rain echo and the prevailing weather situation shows that the melting-band rain, which over this period was responsible for most of the rainfall, is usually associated with low pressure, whereas nonfreezing showers are shown to be more frequently associated with high pressure. (*Same item as* 5.3–41, March 1954, *MAB.*) *Subject Headings:* **1. Radar precipitation echoes 2. Radar echoes 3. Sydney, New South Wales.**—*Author's abstract.*

6G–117 551.501.81:551.577 551.508.1:551.575

Donaldson, R. J.; Atlas, D.; Paulsen, W. H.; Cunningham, R. M. and Chmela, A. C. (*all: AF Cambridge Res. Center*), **Quantitative 1.25 cm observations of rain and fog.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** [v. 1]:VII-6, pub. **1953.** 7 p. 6 figs., table, 6 refs., eqs.) **DLC, DWB**—Observations on 1.25 cm radar at Round Hill Field Station, M.I.T. (Bedford, Mass.) were made from May through July 1953 to determine reflectivity or detectability of rain and fog particles. Results are said to be the first quantitative observations of scattering from rain at 1.25 cm and the first from fog at any wave length. Measurements were made at Buzzards Bay with a horizontal beam elevated 1° above horizontal. Calibration methods as well as results from rain and from fog are described and presented in numerous graphs. Theoretical values are compared with observed for several parameters. *Subject Headings:* **1. Radar rain observations 2. Radar fog observations 3. Buzzards Bay, Mass.**—*M.R.*

6G–118 551.508.85

Farnsworth, G. W. and Mueller, E. A. (*both Ill. State Water Survey, Urbana*), **Radar-rainfall area integrator.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** [v. 1]:OX-3, pub. **1953.** 5 p. fig.) **DLC, DWB**—Characteristics and operational features of this integrator combined with an APS-15 radar are discussed and given in a block diagram. A preliminary analysis of a 45-minute period of data indicates an underestimation of 24–27% of the radar's echo area by the integrator which will become a valuable addition in quantitative rainfall studies by radar when refinements of minor nature are made. A useful radar rainfall equation remains to be developed. *Subject Headings:* **1. Radar analysis of rain 2. Area precipitation integrator.** —*W.N.*

6G–119 551.501.81:551.577 551.508.79:551.578.1

Farnsworth, G. W.; Jones, D. M. A.; Neill, J. C. and Stout, G. E., **Research study on intensity of surface precipitation using radar instrumentation.** Illinois State Water Survey. Meteorological Laboratory, Contract DA36-039-sc-42446, Project DA 3-99-07-022, Project Sc 24-172B, First Quarterly Progress Report, June 1–Aug. 31, **1952;** Second Quarterly Progress Report, Sept. 1–Nov. 30, **1952;** Fourth Quarterly Technical (i.e., Progress) Report, March 1–May 31, **1953;** and Fifth Quarterly Technical Report, June 1–July 31, **1953.** each Report about 15 p. figs., tables

refs. **DWB**—Report 1: The radar installations and their maintenance, the use of the area integrator and the theory of operation of the area integrator, of which a block diagram is given. A photographic technique for measuring particle-size distribution in precipitation is described and a diagram of raindrop camera and the results of measurements are given. The rainfall observations made with the Goose Creek rain gage network are given. Reports 2, 4, 5: The areal precipitation intensity over small catchment areas was measured by the radar sets APS-15, TPL-1 and TPS-10, testing the applicability of the sets and the method itself with the aid of a dense network of precipitation gages. The instrumentation still does not operate entirely satisfactorily. Numerous drop size measurements were made and detailed precipitation data are presented. (For abstract of Fourth Quarterly Technical Report, *see item* 5.3–42, March 1954, *MAB.*) *Subject Headings:* **1. Areal precipitation 2. Radar rainfall measurements 3. Radar analysis of precipitation 4. Drop size measurements 5. Illinois.**—*I.L.D., A.A.*

6G–120 551.501.81:551.594.6

Fleicher, Aaron, **The information contained in weather noise, Pt. A.** Massachusetts Institute of Technology. Dept. of Meteorology. Weather Radar Research, Contract DA-36-039-sc-124, Project DA 13-99-05-022, Technical Report, No. 22, Jan. 15, **1953.** 27 p. 3 refs., eqs. Also his: **Pt. B.** *Ibid.* Dec. 21, **1953.** 15 p. figs., refs., 35 eqs. **DWB**—In Pt. A the fluctuating radar signal (phase and amplitude) from clouds and precipitation regarded as a kind of noise was treated as a statistical time series. A second probability density function was investigated and the computed normal autocorrelation was derived directly from the expression for the signal envelope. (*Same item as* 5.3–45, March 1954, *MAB.*) In Pt. B an attempt is made to set up a mathematical model for determining the integrated effect of the various (assumed) inputs in weather radar, when only the output is known. *Subject Headings:* **1. Radar noise 2. Radar observations.**—*W.N., M.R.*

6G–121 551.501.81:551.551

Fleisher, Aaron (*M.I.T.*), **The radar as a turbulence sensing probe.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9 12, 1953, **Proceedings,** [v. 1]:XI-7, pub. **1953.** 4 p. figs.) **DLC, DWB**—Theory of radar returns from many random scatterers is demonstrated by analogy to black-box where only output is known but input from numerous sources must correspond with vector sum which represents output. The linear moments (or correlation function) correspond to the distribution of gustiness (the first probability density). Examples are given of four such computations and the steps in making these computations are listed. *Subject Headings:* **1. Radar turbulence measurement 2. Autocorrelation function.**—*M.R.*

6G–122 551.501.81:551.515:77

Foster, Hal, **Radar and the weather.** *Scientific American,* 189(1):34–38, July **1953.** illus. **DLC**—The present-day use of radar by the U. S. Air Force, U. S. Weather Bureau and research institutions to locate areas of showers, rain, icing, turbulence or stability, storms and hurricanes is described and many illustrations of the horizontal and vertical structure of such areas on the PPI or RHI indicator shown by radar scope photographs. (*Same item as* 5.4–29, April 1954, *MAB.*) *Subject Headings:* **1. Radar storm detection 2. Radar photographs.**—*M.R.*

6G–123 551.501.81:551.515.3

Freeman, John C., Jr. (*Dept. of Oceanography, Texas A & M College*), **Radar echoes in tornado situations.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** [v. 1]: X-5, pub. **1953.** 6 p. 4 figs., 2 refs.). **DLC, DWB**—Three tornado situations in the spring of 1953 within 120 mi of Austin, Texas, were observed on radar scopes. Two of them were photographed, and in the other case drawings were made of echoes which could be associated with the tornado areas. "Appendages" which occurred on the scope in the vicinity and at the time of the Waco tornado (May 11) are clearly indicated. Intense echoes associated with other storms did not show these "appendages." Also occurrence of appendages does not indicate that a tornado reaches the ground. A brief explanation or theory of tornado formation in terms of vortex sheets is included and the model reproduced schematically. *Subject Headings:* **1. Radar tornado detection 2. Tornado appendages 3. Tornadoes, Texas (1953) 4. Texas.**—*M.R.*

6G–124 551.508.85:551.594.221

Hewitt, F. J., **The study of lightning streamers with 50 cm radar.** *Physical Society of London, Proceedings, Sec. B,* 66(10):895–897, Oct. 1, **1953.** 2 figs., 3 refs. **DLC**—Describes an equipment operating on a wave length of 50 cm (on which echoes from hydrometeors do not appear) for recording echoes from lightning up to a range of 30 km. It is set in operation by noise radiation on 600 Mc/s which always precedes radar echoes. Echoes from discharges within clouds were complex and extended over several km; discharges to ground gave a distinctive series of echoes following each stroke. (*Same item as* 6.4–78, April 1955, *MAB.*) *Subject Headings:* **1. Radar lightning recorders 2. Radar observation of lightning.**—*C.E.P.B.*

6G–125 551.501.81:551.577

Hitschfeld, Walter (*McGill Univ.*), **Measurement and detection of rainfall by radar at attenuating wavelengths.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9-12, 1953, **Proceedings,** [v. 1]: IX-1, pub. **1953.** 5 p. 5 figs., 4 refs., 4 eqs.) **DLC, DWB**—A short summary of two studies (Hitschfeld and Marshall, 6G–184) and Hitschfeld and Bordan (1954) (*see items* 6G–184 and 6G–126) regarding the measurement of rainfall by cm. radar and the sensitivity of radar for measurement of rainfall amounts. It is concluded that intervening rainfall, clouds and gases in the atmosphere decrease the sensitivity at shorter wave lengths even though higher resolution is obtained. Graphs and nomograms show attenuation, errors which may be corrected, and errors after corrections have been applied which depend on distance and intervening rainfall. *Subject Headings:* **1. Radar rainfall measurements 2. Radar sensitivity.**—*M.R.*

6G–126 551.501.81:551.577.11

Hitschfeld, Walter and Bordan, Jack, **Errors inherent in the radar measurement of rainfall at attenuating wavelength.** McGill Univ. Macdonald Physics Laboratory. Stormy Weather Research Group, Contract AF 19(122)-217, Scientific Report MW-12, May **1953.** 34 p. figs., refs., eqs. **DWB**—The equation

$$R=\frac{I^{B/A}e^{y/A}}{\left[\left(\frac{1}{a}\right)^{\alpha}-\frac{\alpha C}{A}\int_0^{r}\gamma B^{\alpha/A}e^{y\alpha/A}d\gamma\right]^{1/\alpha}}$$

for the rate of rainfall R at range r from the radar is derived. Here A and B are numerical constants; C and α are defined by the relation: radar attenuation due to intervening rain (in db) $=C\int R^{\alpha}d\gamma$. The constant a measures the performance of the radar, and is determined by direct calibration. The quantity y is the power level of the received signal, corrected for attenuation by intervening cloud and atmospheric gases. (*Same item as* 5.3–43, March 1954, *MAB.*) *Subject Heading:* **1. Radar rainfall measurements.**—*Authors' abstract.*

6G–127 551.594.7:551.48

Hood, A. D. and Doherty, L. H. (*both Radio and Elec. Engr. Div., Nat'l Res. Council, Ottawa*), **Radar forecasting on Lake Ontario.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** [v. 1]: III-6, pub. **1953.** 7 p. 4 figs. (incl. photos), ref.) **DLC, DWB**—Correlation with duct height as predicted by the power law was compared with the duct height observed at 1830 or 1930 EST, and presented graphically for Aug. and Sept. 1952. The results, excluding days of frontal passage and/or no surface ducts, indicate a maximum value of duct height. No echoes were visible during standard propagation conditions. The diurnal variation is distinct during summer. The 3-cm radar used scanned a 180° sector and gave a vertical view of every 8 ft up to a height of 220 ft every 30 sec. *Subject Headings:* **1. Radar propagation over lakes 2. Superrefraction 3. Forecasting radar conditions 4. Radar propagation ducts 5. Tropospheric propagation 6. Lake Ontario 7. Scarboro, Ontario.**—*W.N.*

6G–128 551.577:551.508.81

Hudson, H. E., Jr.; Stout, G. E. and Huff, F. A. (*all: Ill. State Water Survey, Engineering Subdiv.*), **Rainfall studies using rain gage networks and radar.** *American Society of Civil Engineers, Proceedings,* v. 79, Separate, No. 178, March **1953.** 26 p. 15 figs., 2 tables, refs., 4 eqs. **DWB**—The results of three years of work on concentrated rain gage networks and on measurements of rainfall extent and intensity by means of radar are described. Thunderstorm rainfall is shown to be multicellular, so that the application of area-depth data is more complex than is usually assumed. The orientation, duration, and path of storm cells are shown to have marked effects on area-depth curves for a given basin. Data on area-depth relationships are presented for networks having areas of 5.2 sq mi, 95 sq mi, and 280 sq mi. The effects of gage density on mean rainfall errors are investigated. The heaviest storms were found to be associated with cold fronts. The theory and development of radar for rainfall measurement are reviewed. Available methods of measuring rainfall by radar are discussed. Data collected in the study on radar signal strength and rainfall intensity are presented and analyzed using a new analytical approach. It is concluded that radar is able to depict rainfall extent better than rain gaging, and that radar can measure rainfall intensities as ably as do the rain gage networks generally used. (*Same item as* 5.1–231, Jan. 1954, *MAB.*) *Subject Headings:* **1. Radar rainfall measurements 2. Rain gage networks 3. Rainfall data.**—*Authors' abstract.*

6G–129 551.501.7:551.507.352:551.515.2(759)

Hurricane hunters. *Washington Star Pictorial Magazine,* Wash., D. C., Sept. 13, **1953,** p. 24. **DWB**—Brief general report on hurricane reconnaissance flights made by the Naval Air Force's

Weather Squadron II, based at Jacksonville. Airplane crew members in action, a radar-scope photograph of a hurricane and instruments installed in a hurricane reconnaissance aircraft (barometer, vortex thermometer and altimeter) are shown in photographs. *Subject Headings:* **1. Airplane weather reconnaissance 2. Hurricane reconnaissance 3. Jacksonville, Florida.**—*G.T.*

6G–130 551.501.81:551.574.1

Johnson, David S. (*Pineapple Res. Inst., Hawaiian Sugar Planters' Assoc., Honolulu*), **Application of radar to cloud physics research in Hawaii.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** [v. 1]: VII-2, pub. **1953.** 5 p. 5 figs., 12 refs.) **DLC, DWB**—Two modified AN/APS-2, 10 cm radars with PPI were used in connection with cloud physics studies of warm clouds and cloud seeding in Hawaii. During Sept. 1952 many radar observations of trade cumuli were made at Hana on the east coast of Maui at 60 ft above MSL and at the base of the 10,000 ft volcano Halekala. Trade cumuli rain echoes were observed to move at the same speed as the winds at the elevation of the cloud base as determined by pibal. Radar reflectivity data compared with drop size distributions obtained at ground with dye treated filter paper show large discrepancies, indicating that coalescence, evaporation, etc. below cloud base are serious factors. Rainfall intensities cannot be calculated accurately from radar reflectivity in Hawaii. Radar can serve, however, in 3 ways in cloud seeding experiments: 1) to aid in selecting seeding areas, 2) to guide the plane to correct place for seeding and 3) to check results of seeding if any precipitation echoes form (or not). Intensity of rainfall vs. liquid water content and vs. radar reflectivity is shown graphically with inclusion of data from BLANCHARD at Mauna Loa, and MARSHALL and PALMER (*J. Met.*, 5:165, **1948**). *Subject Headings:* **1. Radar cloud physics research 2. AN/APS-2 radar 3. Cloud seeding experiments 4. Rainfall intensities 5. Drop size distribution 6. Warm cloud rainfall 7. Hawaii.**—*M.R.*

6G–131 551.509.52:551.515.3:551.501.81

Kahan, Archie M. (*Texas A & M College*), **The first Texas tornado warning conference.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin Nov. 9–12, 1953, **Proceedings,** [v. 1]: X-6, pub. **1953.** 4 p.) **DLC, DWB**—The conference was conceived at the time of the Waco tornado on May 11, 1953, and was organized rapidly with full cooperation from all agencies and the help of CAPT. H. T. ORVILLE. The first conference was held on June 24, 1953. The working committee on implementation of the recommendations of the conference met on July 9, 1953 at Waco, Texas and again at Fort Worth on Aug. 20, 1953. The Weather Bureau agreed to furnish any of 100 APS-2 radar sets they were modifying for use as weather radar to any community that would convert them at their own expense. Further implementation took the form of installation of a direct tie line phone from Dept. of Public Safety at Austin and U.S.W.B., and agreement that U.S.W.B. officials could notify local Safety Dept. captains whenever a tornado was imminent. *Subject Headings:* **1. Texas tornado warning network 2. Radar tornado warning networks 3. Tornado warning networks 4. Texas.**—*M.R.*

6G–132 551.501.81:551.577

†§Ligda, Myron G. H., **Horizontal motion of small precipitation areas as observed by radar.** Massachusetts Institute of Technology, Dept. of Meteorology, Contract DA-36-039-sc-124, Project DA 3-99-05-022, Project Sc 122B-0, Technical Report, No. 21, Jan. 10, **1953.** 60 p. 56+figs. (incl. photos.), 32 refs. **DWB**—A detailed analysis of precipitation situations in New England during 1948 and 1949, using radar and radiosonde observations. The monograph contains discussion of controlling factors of small precipition area motion; factors contributing to erroneous determinations of radar measured area; the echo signal increase when thin scattered allostratus or altocumulus clouds lie over a solid nimbostratus deck; and the relation between velocity and geostrophic flow at several constant pressure lines. PPI scope photos and schematic diagrams are profusely scattered. *Subject Headings:* **1. Radar precipitation observation 2. PPI scope photographs 3. Radar weather analysis.**—*M.R.*

6G–133 551.501.81

L'indagine dei fenomeni atmosferici a mezzo del radar. [Investigation of atmospheric phenomena by means of radar.] *Geofisica e Meteorologia*, Genoa, 1(1):20–22, Jan./Feb. **1953. DWB**—Summary of findings reported in the report of the Stormy Weather Research Group of the Weather Radar Conference at McGill Univ., Sept. 1952. *Subject Headings:* **1. Cloud physics 2. Artificial precipitation 3. Radar meteorology.**—*M.R.*

6G–134 551.501.81:551.515.81:551.594.221

Marshall, John Stewart, **Frontal precipitation and lightning observed by radar.** *Canadian Journal of Physics*, 31(2):194–203, Feb. **1953.** 6 figs., 4 refs. **DLC**—A typical pattern (revealed by radar) of precipitation along a cold front includes both showers containing many nearly vertical

cells, and continuous rain characterized by uniformity below the freezing level and the "bright band" of scanning at angles of elevation up to 30°. At wave length 3 cm, observations of this sort reveal some of the snow above the bright band, and its trailing pattern. At 10.7 cm, little is seen of the snow, but transient echoes with duration of the order of one second are observed, attributable to lightning. These echoes have not been detected when scanning in the vertical at wave length 3.2 cm, although others have reported something of the sort at 3.2 cm when different observing techniques were used. The transient echoes occur outside, but close to, regions of rain; most frequently about one mile from the top of a shower cell. It is probable, combining 3.2 cm observations of snow on one occasion with 10.7 cm observations of the transients on another occasion, that the transients occur in regions not only near rain, but at the same time in or near a region filled with snow. (*Same item as* 4.10–34, Oct. 1953, *MAB.*) *Subject Headings:* **1. Radar storm detection 2. Frontal structure 3. Radar echoes from lightning.**—*Author's abstract.*

6G–135 551.578.41:551.501.8

Marshall, J. S., **Precipitation trajectories and patterns.** *Journal of Meteorology*, 10(1):25–29, Feb. **1953.** 7 figs., 3 refs., 2 eqs. **MH-BH.** Also issued as: McGill University. Macdonald Physics Laboratory. Stormy Weather Research Group, Contract AF 19(122)-217, Scientific Report, MW-8, Aug. **1952.** 22 p. 8+figs., 4 refs., 2 eqs. **DWB**—Falling snow is shown in height/range radar sections as streaks. With wind shear and rate of fall constant these are parabolic, becoming nearly horizontal near ground. This is related to movement of small precipitation-forming elements. Different sizes of flakes cause sorting of snowflakes, largest reaching ground first, and broadening of streaks. Effect of updrafts and passage through 0°C level are discussed. (*Same item as* 4.9 190, Sept. 1953, *MAB.*) *Subject Headings:* **1. Snow analysis 2. Radar analysis of precipitation.**—*C.E.P.B.*

6G–136 551.501.8

Massachusetts Institute of Technology. Dept. of Meteorology, **Weather Radar Research.** Contract DA-36-sc-42625, Quarterly Technical Reports, No. 1 and No. 2, June 15, **1953** and Dec. 15, **1953.** 8 p.+7 p. Two pieces. **DWB**—Progress achieved during the first report period (March 1–May 31, 1953) is summarized in a general account of publications and conferences, instrumentation (radar signal intensity, radar signal fluctuations, radar equipment, meteorological instruments), personnel and plans for the future. This report is a continuation of a series including 21 reports under Contract W36-039-sc-32038 and 11 reports under Contract DA-36-039-sc-124. The second report deals with twenty-one weather situations, which provided opportunity for studies of echo intensities, storm structure, fluctuation rates, and precipitation physics. The measuring accuracy of the radar systems and their associated instruments was improved. Particularly accurate fluctuation rate tape recordings were taken. The new, sensitive rain rate gauge was completed. A violent tornado and the edge of a decaying hurricane were observed. *Subject Headings:* **1. Radar meteorology 2. Radar storm detection 3. Radar equipment.**—*G.T., Author's abstract.*

6G–137 551.501.81:551.515.3

Mayer, Rollins H. (*A. F. Missile Test Center, Patrick AFB, Fla.*), **A proposal for research on the possibility of the destruction of tornadoes with missiles guided by weather radar.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** [v. 1]: X-8, pub. **1953.** 4 p. 6 refs.) **DLC, DWB**—The tornado-destruction program outlined here is based on ROSSMAN's theory that tornadoes can be dissipated and destroyed by disrupting the critical stabilized diameter at the feeding source. The objective may be accomplished by specifically designed radar sets for tornado detection, jet planes launching the guided missiles and mobile tornado stations incorporated in the nation-wide network. *Subject Headings:* **1. Tornado dissipation 2. Radar tornado detection.**—*W.N.*

6G–138 551.501.81:551.594.221

Miles, V. G., **Radar echoes associated with lightning.** *Journal of Atmospheric and Terrestrial Physics*, 3(5):258–262, June **1953.** 2 figs., table, 3 refs. **MH-BH**—Radar echoes are described from overhead (with photographs) and distant thunderstorms. The echoes from overhead storms showed lightning flashes at base heights of 4 to 9 km, duration 0.14 to 0.47 sec, sometimes in pairs at different heights. They are attributed to sharply defined highly ionized upper end of the discharge channel. Lightning echoes from distant storms last 1/50 sec, are roughly rectangular with steep sides, and extend over a range of about 5 km. (*Same item as* 4K 268, Nov. 1953, *MAB.*) *Subject Heading:* **1. Radar echoes from lightning.**—*C.E.P.B.*

6G–139 551.501.81:551.577 551.508.77

*Neill, J. C., **Analysis of 1952 radar and raingage data.** *Illinois. State Water Survey Div., Report of Investigation*, No. 21, **1953.** 22 p. 18 figs., 7 tables, eqs. **DLC**—The analysis includes

an elaborate statistical study of sampling errors arising from: a) number of rain gages, b) size of storm and c) time interval between radar measurements. It was found that the error increases as the number of gages decreases (for 0.50″ rainfall 24 gages/96 sq mi gave 0.014 error, 4 gages gave 0.06 and 1 gage 0.17); as the size of the storm increases (0.50″ gave error of 0.061, and 1.0″ gave 0.089 error for 4 gages in 96 sq mi); and as the time interval increases (2 min intervals 0.005″, 25 min intervals 0.118″ for 0.50 rainfall). Other relationships are shown in tables and nomograms and are discussed analytically (e.g., relation of rainfall rate to percent of total accumulative water in 8 storms over Goose Creek network). *Subject Headings:* **1. Radar rainfall measurements 2. Rainfall sampling errors 3. Rain gage data analysis 4. Goose Creek, Ill.**—*M.R.*

6G–140 551.501.81:551.578.1

*Neill, J. C. (*Ill. State Water Survey, Urbana*), **Variance of areal-mean thunderstorm rainfall estimates.** (In: Conference on Radio Meteorology, University of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** [v. 1]: IX-2, pub. **1953.** 5 p. fig., table, eqs.) **DLC, DWB**—Purpose of this analytical study was to determine a measure of deviation for various gage densities which was applicable to radar areal-mean rainfall estimates. Analyzed rainfall data (July–Sept. 1952) from 48 gages for 16 thunderstorms on a 96 sq mi network are tabulated and a graph shows that the radar's accuracy (assuming ±.05 error of a 1 in. mean rainfall) is equivalent to 8 gages over 96 sq mi. *Subject Headings:* **1. Radar analysis of rain 2. Rain gage data analysis.**—*W.N.*

6G–141 551.501.83:551.5154:016

†Nupen, Wilhelm; Rigby, Malcolm and Martinoff, Katherine, **Selective annotated bibliography on thunderstorm sferics.** *Meteorological Abstracts and Bibliography,* Boston, 4(11):1304–1359, Nov. **1953.** 295 refs. **MH-BH**—The 295 references have been chosen as representative of the vast amount of literature available on the subject. A detailed subject outline indicates the wide variety of aspects covered in this bibliography on atmospherics from thunderstorms. A geographic outline is also provided. The references, which are arranged chronologically, are annotated. (*Same item as* 6B–165, Feb. 1955, *MAB.*) *Subject Heading:* **1. Bibliography on thunderstorm sferics.** —*M.L.R.*

6G–142 551.501.81:551.515.3

Orville, Howard T., **Expert urges radar network to end tornado surprises.** *Evening Star,* Wash., D. C., p. A-4, June 11, **1953. DLC**—Report on a TV lecture delivered by Capt. Howard T. Orville, in which the retired Navy meteorologist suggested a network of 35 electronic weather stations to be established throughout the U. S. According to the speaker, such a network could be completed within 10 years at a cost of $5 million a year. It would eliminate the element of surprise and thus save 60 percent of deaths and destruction caused by tornadoes. *Subject Headings:* **1. Radar storm detection 2. Tornado forecasting.**—*G.T.*

6G–143 551.501.81:551.515.4(676)

Perry, R. E., **The radar detection of dangerous storms.** *Institute of Navigation, London, Journal,* 6(3):238–239, July **1953.** 2 figs., table. **DWB**—Description of a radar equipment at Entebbe airport, Uganda, to detect CuNb clouds at long ranges and provide warnings over 45,000 sq mi. A specimen PPI of CuNb cells is reproduced. (*Same item as* 5.9–40, Sept. 1954, *MAB.*) *Subject Headings:* **1. Radar storm detection 2. Entebbe Airport, Uganda.**—*C.E.P.B.*

6G–144 551.501.81:551.311.181

Perry, R. E., **A record of radar performance in ice conditions. Extracts from a log.** *Institute of Navigation, London, Journal,* 6(1):74–85, Jan. **1953.** 16 figs., 3 tables. **DWB, DLC**—Record of observations on voyage from Cardiff to Port Churchill and back, on location of icebergs. Effect of ice and cold water on radar horizon through sub-refraction discussed. (*Same item as* 5.9–41, September 1954, *MAB.*) *Subject Heading:* **1. Radar echoes from sea ice.**—*C.E.P.B.*

6G–145 551.501.81:551.571

Plank, Vernon G. (*U. S. A. F. Cambridge Res. Center*), **A meteorological study of angels at 1.25 cm.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** [v. 1]: IV-3, pub. **1953.** 7 p. fig., 9 refs.) **DLC, DWB**—During 15 months of vertical cloud observation on 1.25 cm radar at AFCRC, 84 days were found suitable for angel study. Six degrees of intensity were reached and mean altitudes were assigned by 500 ft intervals. On the 84 days when precipitation or instrument noise did not preclude analysis, 57 days had angels, 35 had less than light, 11 less than heavy activity, and 27 none at all. Most favorable conditions are high temperature, low wind speed, and high moisture content or discontinuities. After thunderstorms or heavy rain or the dissipation of a low cloud deck they are frequent, but never observed below 25°F or over snow cover. Insect explanation is examined in full and found insufficient. Graphs

reproduced show summer and mid-day are the most frequent times, while winter and night the least. *Subject Headings:* **1. Angels 2. Radar reflections from discontinuities 3. Seasonal effects on angels 4. Tropospheric propagation.**—*M.R.*

6G–146 551.501.81:551.577

*Richards, William J. (*Evans Signal Lab., Belmar, N. J.*), **The frequency of radar storm echoes as a function of position.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** [v. 1]: XI-3, pub. **1953.** 4 p. 2 tables.) **DLC, DWB**—Air mass, seasonal, diurnal and directional frequencies of occurrence of 11,205 precipitation echoes observed from Sept. 1950 to March 1953 on PPI scope of an AN/CPS-9 radar at Evans Signal Lab., Belmar, N. J. (within a range of 200 mi) are tabulated and summarized. The year was divided into 4 seasons, the horizon into 16 sectors (combined into 4 sectors in present tabulation), the day into 3 eight-hour periods (0–8, 8–16 and 16–24h) and the distance into 2 sectors (0–100 and 100–200 mi). Air mass, warm front and cold front rain was also differentiated. The east or ocean side got more precipitation at all seasons except summer and the NE quadrant was most active in spring, the NW in summer, and the SE in autumn and winter. The SE quadrant was most active for air mass and warm front precipitation. *Subject Headings:* **1. Radar precipitation statistics 2. Precipitation echo (direction).**—*M.R.*

6G–147 551.578.11:551.501.81

Rigby, E. Caroline and Marshall, J. S., **Modification of rain in showers with time.** McGill Univ. Macdonald Physics Laboratory. Stormy Weather Research Group, Contract AF19(122)-217, Scientific Report MW-10, March **1953.** 40 p. figs., tables, 7 refs., eqs. **DWB**—Changes in the drop-size distribution during showers are analyzed theoretically and compared with observational data. The theory of radar measurement of showers, and radar echoes obtained with the RCAF Microwave Height Finder installed at Ottawa are discussed. (*Same item as* 5.4–194, April 1954, *MAB.*) *Subject Headings:* **1. Rainfall structure 2. Radar precipitation echoes.**—*G.T.*

6G–148 551.577:621.396.9

Robinson, N. P., **The propagation of 8 mms. wavelength radiation through rain, snow, hail and fogs.** *Great Britain, Ministry of Supply, Technical Note,* No. 191, **1953.** 11 p. 4 plates, table, 25 refs., 12 eqs. Mimeo. **GB-MO**—Attenuation by rain was approximately proportional to precipitation rate (0.26 db/km/mm/hr) over range of 1–11 mm/hr. Echo intensity agreed well with theoretical values found by J. W. and D. Ryde. Echo intensity from fogs was too low to be detected but attenuation was of same order as that predicted by theory. Attenuation through a hailstorm may be considerable. Moist snow caused attenuation 2½ times that of rain at same precipitation rate. Echo intensity from dry snow was 14–19 dbs less, and of rain 2–8 dbs less than from melting band (bright band). (*Same item as* 6.2–258, Feb. 1955, *MAB.*) *Subject Headings:* **1. Radar precipitation echoes 2. Radar attenuation.**—*C.E.P.B.*

6G–149 551.501.81:551.501.9

Rockney, Vaughn D. and Jay, Lee A. (*both U. S. W. B., Wash., D. C.*), **The radar storm detection program of the U. S. Weather Bureau.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** [v. 1]: X-2, pub. **1953.** 7 p. fig., table.) **DLC, DWB**—A chart of the U. S. shows location of U. S. Weather Bureau stations equipped with storm detection radar (APS-2F) operating at 2850 mc (1.25 cm). The network was started in 1946 when 25 surplus Navy airborne sets were obtained and converted for ground use, changing frequency, range, sensitivity, PPI scope, size, etc. At the time of the article there were 23 stations, 9 operated by cooperative institutions. Purposes (forecasting, observation of storms and research) are outlined and plans for expanding use of radar for detection of tornadoes, hail, hurricanes, fire weather and other aspects of U. S. Weather Bureau program are discussed. *Subject Headings:* **1. Radar storm detection networks 2. United States.**—*M.R.*

6G–150 551.501.81:551.577

Schweitzer, H., **Bestimmung der Feinstruktur von Wolken und Niederschlagsgebieten durch Zentimeter-Radarwellen.** [Determination of the fine structure of clouds and rain regions by centimeter radar.] *Umschau,* 53(11):328–329, June 1, 1953. fig. 2 refs. **DWB**—Discussion of the difficulty of applying Rayleigh's scattering theory to "bright band" reflection of 1–10 cm radar, and summary of existing knowledge as set out by N. R. Labrum and J. W. Ryde. (*Same item as* 4.10–36, Oct. 1953, *MAB.*) *Subject Heading:* **1. Bright band echoes.**—*C.E.P.B.*

6G–151 551.501.81:551.515 551.509.21:621.396

[Severe weather broadcasts and storm detection radar network of the Weather Bureau. . . .] *Air Facts,* 16(5):67, May 1, **1953. DWB**—1. Note on the usefulness of "Severe Weather Broadcasts"

for private pilots and acknowledgment of the initiative displayed by the U. S. Weather Bureau in establishing them. 2. Progress achieved by the Weather Bureau in building up its radar storm detection network consisting of 25 stations (listed) already operating or to be completed by the end of 1953 is briefly summed up. *Subject Headings:* **1. Weather broadcasting 2. Radar storm detection 3. U. S. Weather Bureau.**—*G.T.*

6G–152 551.501.81:551.509.34

Stout, Gleason E. (*Ill. State Water Survey*), **Radar in single station analysis.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** [v. 1]: XI-2, pub. **1953.** 6 p. 4 figs., 2 refs.) **DWB, DLC**—This brief discussion shows that the potentialities of radar can be further exploited by the qualified meteorologist. A number of meteorological parameters deduced from PPI observations are presented. Evaluation and research into interpretation of scope patterns is an open field for promising exploration. *Subject Headings:* **1. Radar 2. Single station forecasting.**—*W.N.*

6G–153 551.515.3:551.501.8

Stout, G. E. and Huff, F. A., **Radar records Illinois tornadogenesis.** *American Meteorological Society, Bulletin,* 34(6):281–284, June **1953.** 2 figs., 2 refs. **MH-BH**—Radar PPI scope photographs taken during routine radar rainfall measurements on April 9, 1953 at Urbana, Ill., show a remarkable spiral cloud formation which lasted from about 1700 to 1738 local time and coincided with the passage of an actual tornado of great intensity and breadth that did $3 million damage. The 12 pictures from the APS-15 3 cm radar scope show the various stages of development from 1644 to 1800 h. Meteorological conditions are described. This is the first radar photograph of a tornado vortex cloud ever published. *Subject Headings:* **1. Tornado, Urbana, Ill. (April 1953) 2. Radar tornado photographs 3. Urbana, Ill.**—*M.R.*

6G–154 551.501.81:551.577.2(773)

*Stout, Gleason E.; Neill, J. C. and Farnsworth, G. W., **Rainfall-radar studies of 1951.** Illinois. State Water Survey. Meteorologic Laboratory, Contract DA 36-039-sc-42446, Project DA 3-99-07-022, Project SC 24-172B, Research Report, No. 1, May **1953.** 41 p. 15 tables, 33 figs., 16 refs. Also issued as: *Illinois. State Water Survey, Report of Investigation,* No. 19. **DWB**—Equipment was developed for the photographic recording of rain-intensity contours as observed by a 3 cm radar set, checking the results by a network of 37 recording gages on a watershed and preparing isohyetal maps for each minute. The individual rates computed from radar deviated considerably from the rain gage measured rates, but mean areal rainfall could be estimated accurately. A calibrated radar could indicate rainfall intensity from 0.48 to 2.30 mm/hr. A rainfall summary from May to Oct. 1951 over the Goose Creek network is attached. (*See also* 4.7–24, July 1953; *same item as* 5.10–29, Oct. 1954, *MAB.*) *Subject Headings:* **1. Radar rainfall measurement 2. Rainfall intensity distribution 3. Goose Creek, Illinois.**—*A.A.*

6G–155 551.501.81:551.577

Stout, G. E. and Neill, J. C. (*Urbana, Ill.*), **Utility of radar in measuring areal rainfall.** *American Meteorological Society, Bulletin,* 34(1):21–27, Jan. **1953.** 6 figs., table, 7 refs. **MH-BH**—Areal rainfall distribution over a 50 square mile area was observed by 3 cm radar and by a rain gage network of 33 rain gages. Isohyetal maps were prepared from both rain gage and radar observations in order to compare the rainfall distribution as observed by the two rainfall observation techniques. The computed rainfall values were at least as accurate as those obtained by a rain gage network of one gage per 200 sq mi and in some cases they were considerably more accurate. (*Same item as* 4.10–37, Oct. 1953, *MAB.*) *Subject Headings:* **1. Radar analysis of rain 2. Rain gages 3. Rainfall distribution 4. Illinois.**—*Authors' abstract.*

6G–156 551.578.11:551.501.81

Styles, R. S. and Campbell, F. W., **Radar observations of rain from non-freezing clouds.** *Australian Journal of Physics,* Melbourne, 6(1):73–85, March **1953.** 6 figs., table, 6 plates, 10 refs. **DLC**—It is now conceded that drizzle or light rain may fall from clouds which do not reach freezing level, but it is still not generally accepted that heavy precipitation is also possible from such clouds. This paper adds five further air-borne radar observations of nonfreezing rain (in the vicinity of Sydney, Australia; lat. 35°S) to the relatively few accounts of moderate to heavy precipitation already recorded as falling from such clouds. Observations described are of rain, which at its peak reached "very excessive" proportions at ground level, falling from clouds 9000–10,000 ft deep, which had developed in a maritime air mass either over sea or slightly inland. The shape of the radar echo observed from the rain in these clouds was that of a vertical column. The radar echo reached its maximum development at or just prior to the time of maximum development of the cloud, following which both the cloud and the radar echo immediately commenced to subside or dissipate.

Maximum precipitation rate at ground level generally occurred after the cloud had passed its maximum development. While storm was developing the radar echo was generally characterized by a maximum in the middle levels of the cloud, but during the decay stage the radar echo became more uniform with height. These observations support the theory that the mechanism of rain formation at work in such clouds is that of coalescence of water drops. (*Same item as* 5.4–196, April 1954, *MAB.*) *Subject Headings:* **1. Rain from nonfreezing clouds 2. Radar precipitation echoes 3. Raindrop coalescence 4. Sydney, Australia.**—*Authors' abstract.*

6G–157 551.501.81:551.509.31

Swingle, D. M. and Rosenberg, L. (*both Evans Signal Lab., Belmar, N. J.*), **Mesometeorological analysis of cold front passage using radar weather data.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** [v. 1]: XI-5, pub. **1953.** 3 p.) **DWB, DLC**—A severe thunderstorm situation on July 19, 1951 in the N. Atlantic States, was studied by means of (a) conventional mesosynoptic analysis based on hourly (1230–2130 E.S.T.) sequences and (b) cross sections from surface and upper air reports, and (c) radar data taken from still and motion picture photos added to hourly data as above. The conventional analyses did not reveal many developmental features which were detected by radar. The cold front, pre-frontal squall lines, waves, etc. were relocated in situations where topography could not alone account for developments or movements. For 3–6 hr detailed forecasting this procedure is recommended. *Subject Headings:* **1. Radar synoptic analysis 2. Microsynoptic analysis 3. Radar squall line detection 4. Squall line forecasting 5. North Atlantic States.**—*M.R.*

6G–158 551.501.81:551.571

Swingle, Donald M. (*Signal Corps Eng. Lab., Fort Monmouth, N. J.*), **Reflections on electromagnetic waves from media of continuously variable refractive index.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** [v. 1]: IV-2, pub. **1953.** 7 p. 3 figs., 6 refs., 17 eqs.) **DLC, DWB**—The theoretical analysis presented is based on the assumption of small change in the refractive index and gives a good approximation of the lower atmosphere where the maximum possible change is of the order of 0.3%. Extension of the analysis may permit inclusion of both large changes of index and spherical waves. The method may be applicable to situations where no direct discontinuity of the refractive index occurs. It is shown that a plane-wave pulse containing an integral number of cycles, propagating through a region of constant refractive index gradients, produces no reflection. *Subject Headings:* **1. Radar reflections from discontinuities 2. Refractive index discontinuities 3. Tropospheric propagation.**—*W.N.*

6G–159 551.501.81:551.576

*Swingle, Donald M., **A review of results of operational tests of radar cloud detection equipment.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** [v. 1]: X-4, pub. **1953.** 2 p. 2 tables.) **DLC, DWB**—During a 1 year test (Nov. 1951–Nov. 1952), daytime cloudiness was observed by means of vertically oriented 0.86 cm radar with 7 ft paraboloid antenna (which replaced earlier 1.25 cm–5 ft parabolic equipment) for 953 hrs. Visual observation was more effective with FrSt and FrCu clouds, results were roughly equal for Cu, StCu, St and NbSt, and with ASt and CiSt the radar was superior, and with ACu and Ci it was 0.6 to 0.9 times as effective. Over all radar detected 2.2 times as many clouds as it missed and 47% more than visual means. Tables give results for different types of clouds by radar, radar and observation, and by observation only. *Subject Headings:* **1. Radar cloud observation 2. Radar.**—*M.R.*

6G–160 551.509.54:551.501.81

Swingle, Donald M. and Richards, William J., **The variability of the motion of radar precipitation lines.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** [v. 1]: XI-4, pub. **1953.** 3 p. table.) **DLC, DWB**—A study of 44 rain storms from still photographs of radarscopes at Belmar, N. J., and from time-lapse moving pictures at M.I.T. (1946–1953), even after smoothing somewhat, showed an extremely variable speed of motion from hour to hour. The calculated speeds ranged from 10 to 63 mph and averaged 24.9 mph with an average of 19.4 mph (18.4 for front, and 20.4 for rear edge). An example from 4 Jan. 1952 shows speeds by half hourly periods from 1730 to 2225 E over a distance of 73 mi. Forecast times of arrival were far off, especially when calculated from last ½ hr movement extrapolated, but not so bad when calculated on average movement from time of first sighting precipitation line. The worst results were 4 hrs off, when calculated only one hour before arrival. *Subject Heading:* **1. Radar rain forecasting.**—*M.R.*

6G–161 551.551:551.501.8:629.13

Tolefson, H. B., **Some possible reductions in gust loads through use of radar in transport airplanes.** *American Meteorological Society, Bulletin,* 34(5):187–191, May **1953.** 4 figs., 5 refs. **DWB**—Turbulence data obtained under different weather conditions by means of air-borne radar

were analyzed in order to determine possible reduction in gust loads and increases in passenger comfort attainable through the use of radar in detecting and avoiding storm areas. The use of air-borne 3 cm radar for thunderstorm detection would lead to a reduction in gusts which are encountered in clear air or convective activity. Its use in thunderstorm avoidance might result in a 10% reduction in maximum gust loads. Contour radar would aid in selecting the smoothest flight path through storms that could not be avoided. (*Same item as* 6.1–207, Jan. 1955, *MAB.*) *Subject Headings:* **1. Air-borne weather radar 2. Radar dtorm detection 3. Thunderstorm turbulence 4. Gust loads 5. Aeronautical meteorology.**—*I.L.D.*

6G–162 551.577.1:551.501.81

Twomey, S., **On the measurement of precipitation intensity by radar.** *Journal of Meteorology*, 10(1):66–67, Feb. **1953.** 2 figs., 9 refs. **MH-BH**—Precipitation rate R (mm/hr) is related to drop diameter D (mm) by $\Sigma N D^6 = 127\ R^{2.287}$. $\Sigma N D^6$ is calculated from power of radar echo. Correlation 0.89 but error of calculated precipitation rate may be considerable. (*Same item as* 4.8–189, Aug. 1953, *MAB.*) *Subject Heading:* **1. Radar analysis of precipitation.**—*C.E.P.B.*

6G–163 551.509.52:551.515:551.501.81

U. S. Weather Bureau, **Radar weather observations in the Texas area.** Wash., D. C., July **1953.** 4 p. 2 diagrs., 16 photos. **DWB**—The Texas radar plan is discussed and mapped. It requires at least 15 more radar sets to assist the seven radars in operation (on July 1, 1953) in Texas and Louisiana. Experience from radar storm warning shows that the destruction by hurricanes can be reduced by some 60%; in addition human lives are saved by tornado warning. Excellent radar scope photographs show cold front, thunderstorms, tornado and hurricanes. *Subject Headings:* **1. Tornado warning network 2. Radar tornado warning networks 3. Texas.**—*W.N.*

6G–164 551.511:551.551

Warner, J. and Bowen, E. G. (*Commonwealth Sci. and Ind. Res. Organiz., Australia*), **A new method of studying the fine structure of air movements in the atmosphere.** *Tellus*, 5(1):36–41, Feb. **1953.** 10 figs. **MH-BH**—Bundles of light metal foil ("window") falling at about 100 cm/sec in still air were tracked by radar in Australia after being released from airplanes in or around cumulus clouds or wherever knowledge of the vertical motions or small scale horizontal motions in the air or in clouds is desired. Similar releases have been made from balloons at altitudes above 12 km indicating wind shear as well as vertical speeds. Amount of convergence or divergence near a convective cloud can be determined from relative areas enclosed by positions of several bundles at given moments. Fine structure of wind can be determined for a range of 1 to 100 km by this technique. Should prove useful in studying free air turbulence or lee waves on a large scale (compared to instrumental techniques). (*Same item as* 5.2–102, Feb. 1954, *MAB.*) *Subject Headings:* **1. Radar vertical motion measurements 2. Metal foil (window) dispersion 3. Turbulence measurement.**—*M.R.*

6G–165 551.501.81:551.515

Weil, Joseph and Latour, M. H. (*Florida Univ.*), **Use of electronic surveying equipment in meteorology.** *Surveying and Mapping*, Wash., D. C., 13(14):453–461, Oct./Dec. **1953.** 6 figs. **DLC**—General remarks on application of special radar equipment to location of precipitation, tornadoes, storms, etc., are followed by detailed discussion of hurricane location by the University of Florida's equipment (120 ft radar tower and radarscope photos of Aug. 1949 hurricane are shown in illustrations). *Subject Headings:* **1. Radar storm detection 2. Radar hurricane location.**—*M.R.*

6G–166 551.501.81:551.515.41

Wexler, Raymond, **Radar echoes from a growing thunderstorm.** *Journal of Meteorology*, 10(4):285–290, Aug. **1953.** 3 figs., 5 tables, 13 refs., 4 eqs. **MH-BH**—A theoretical expression is obtained for rate of growth of an ice sphere. Hail trajectories in various updrafts are computed. Minimum hail diameters, of various concentrations, detectable by radar at 25 km, and temperature of first radar echo with various updrafts are calculated. Four conclusions about behavior of radar echo are set out. With an updraft of 3 m/s first echo occurs at −8 to −11°C. This and subsequent extension of the echo are in good agreement with the observations of E. J. Workman and S. E. Reynolds (1949) (*see item* 4K–213, Nov. 1953, *MAB*) in New Mexico. (*Same item as* 5.5–33, May 1954, *MAB.*) *Subject Headings:* **1. Radar echoes from thunderstorms 2. Thunderstorm dynamics.**—*C.E.P.B.*

6G–167 551.501.81:621.396.8:551.577

Wexler, Raymond and Austin, Pauline (*both M.I.T.*), **Radar signal intensity from different levels in continuous precipitation.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** [v. 1]: VII-3, pub. **1953.** 6 p. 6 figs., 6 eqs.) **DLC, DWB**—A Pulse Integrator attached to a CPS-9 radar, with 3.2 cm wavelength and beam width of 1° was

used to measure intensity of precipitation at ranges of 8 to 11 mi. A Hudson Jardi rain gage was located 11 mi NW of radar so radar measurements could often be coordinated with actual intensity measurements. Measurements were made on 8 days of uniform precipitation from Jan.–April 1953. Z values were found to approximate the steady state model during the middle stages of the storm, but in the early stages the Z values grow very rapidly between $-7°$ and 0°C due to growth of ice crystals by sublimation, etc. In the final, light rain stage Z values degenerate into layers of maximum values above 15,000 ft and minimum values below. Two cases of heavy rain showed extremely rapid growth. *Subject Headings:* **1. Radar signal intensity (Z values) 2. Radar precipitation echoes.**—*M.R.*

6G–168 551.501.81

Williams, Edwin L. (*Raytheon Mfg. Co.*), **The present status of the AN/CPS-9 program.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** [v. 1]: X-3, pub. **1953.** 5 p. 4 figs. (incl. photos).) **DLC, DWB**—Operating characteristics of AN/CPS-9 system are: pulsed output 3.2 cm, 250 kw peak output, 1° beam width, 7″ Range Height Indicator (RHI), 10–100 mi range and 50,000 ft height; 7″ PPI with 25 to 400 mi ranges; continuous drive scan in either direction at 5 rpm; automatic scan 0–50° wide in azimuth or elevation; range markers at 1, 5, 25, or 100 mi intervals and azimuth at 10° intervals. The equipment has been subjected to a number of tests and is designed for detection of moisture laden storms. Over 50 systems are being built by Raytheon Mfg. Co. *Subject Headings:* **1. Radar equipment 2. Radar storm detection.** —*M.R.*

1954

6G–169 551.576.11:551.501.81

Atlas, David, **The estimation of cloud parameters by radar.** *Journal of Meteorology,* 11(4):309–317, Aug. **1954.** 4 figs., 3 tables, 21 refs., 7 eqs. **DWB**—The radar reflectivity factor $Z=\Sigma Nd^6$ can give estimates of liquid water content W and medium volume diameter d_0 (or other characteristic diameter) in clouds because of relations between Z, W and d through a reflectivity coefficient $G=d_0^{-3}(\Sigma Nd^6/\Sigma Nd^3)$ which increases with spread of drop size and therefore varies with cloud type about a preferred value of 1.35. It is shown that drops $>d_0$ account for about 75% of the reflectivity. A graph is given of icing rate in terms of Z and W from which icing risk may be estimated from Z. An appendix describes a theoretically feasible method of measuring W by relative attenuation of two wave lengths. (*Same item as* 5.11–152, Nov. 1954, *MAB.*) *Subject Headings:* **1. Radar analysis of clouds 2. Icing of aircraft.**—*C.E.P.B.*

6G–170 551.577:551.501.81

Atlas, David, **Observations of "warm" showers in Ohio.** *Journal of Meteorology,* 11(3):254–256, June **1954.** 2 figs., 2 tables, 4 refs. **MH-BH**—Evidence by L. J. Battan (*see item* 5.3–257, March 1954, *MAB*) is strengthened by 3 cm radar observations of rainstorms. Many of these showed echo tops entirely below 0°C level, the proportion decreasing with distance and therefore with height. (*Same item as* 6.5–235, May 1955, *MAB.*) *Subject Headings:* **1. Precipitation formation 2. Cumulus clouds 3. Radar rainfall measurement.**—*C.E.P.B.*

6G–171 551.501.81:551.515.11:551.576

Bemis, Alan C. and Fleisher, Aaron (*both M.I.T.*), **A new contribution to the study of incipient cyclogenesis as observed on the AN/CPS-9 Phi scope.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Supplement to the Proceedings,** IX-4, pub. **1954.** 4 p. 3 figs. [incl. photo.], ref., eq.) **DWB, DLC**—This is a brief theoretical discussion of the problem of "warm seeding from above" shown in a PHI photograph. Computations of the precipitation intensity P and the stream function U as obtained from radar data are presented graphically along with a theoretical curve. *Subject Headings:* **1. Radar cloud detection 2. Radar photographs.** —*W.N.*

6G–172 551.501.81:551.515.3

Blackmer, Roy H., Jr. (*M.I.T.*), **Radar scope photographs of the Worcester Tornado.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Supplement to the Proceedings,** X-9, pub. **1954.** 6 p. 7 figs. [incl. photos], ref.) **DWB, DLC**—The difference between 3 cm and 10 cm radar sets as far as details of checking the squall line of June 9, 1953 are concerned, is featured in RHI and PPI photographs, taken at 3 second intervals. The 3 cm radar photographs show the effects of attenuation by the intense rain, hence is good only when tornado forms after the passing of the shower. The 10 cm set shows the bulge which at all times is exactly above the tornado itself. *Subject Headings:* **1. Radar tornado detection 2. Radar precipitation echoes 3. Radar photographs.**—*W.N.*

6G–173 551.501.81:551.574.1:551.576.11

†Browne, Ian C.; Palmer, H. P. and Wormell, T. W., **The physics of rainclouds.** *Royal Meteorological Society, Quarterly Journal*, 80(345):291–327, July **1954.** 10 figs., 135 refs., eqs. **DWB**—This authoritative review opens with a statement of the problems and a summary of observations of temperature of cloud summits, radar data, results of cloud seeding experiments and rain from non-freezing clouds. Authors then turn to physical properties of precipitation elements, including terminal velocities of raindrops and hailstones, collection efficiencies of falling raindrops, coalescence, fragmentation of drops and splintering of ice crystals. The nature and concentration of condensation and freezing nuclei are discussed, leading to theory and observation of processes of condensation, evaporation and sublimation. Sec. 4 deals with the depth, extent, updraft, turbulence, humidity, liquid water content and droplet size, first of layer clouds and then of convective rainclouds and cumulonimbus cells, Sec. 5 discusses cloud budgets and formulates models of a cloud in a steady state and a convective raincloud, including initiation and growth of precipitation elements. Sec. 6 goes into the physics and results of radar cloud studies, with a schematic diagram of echo intensity from various levels. The review ends with a list of four unsolved problems, a comprehensive list of references, and a collection of useful constants. (*Same item as* 5.11–26, Nov. 1954, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Radar echoes from clouds.**—*C.E.P.B.*

6G–174 551.501.81:551.577.21

Buswell, A. M.; Stout, G. E. and Neill, J. C., **Quantitative measurement of rainfall by radar.** *American Water Works Association, Journal*, 46(9):837–852, Sept. **1954.** 10 figs., table, 10 refs. **DLC**—A dense net of rain gages makes it possible to show the extremely variable nature of convective rainfall (which comprises most of the precipitation in the Illinois-Indiana area). Gage spacing throughout Illinois is not dense enough, however, to reveal the true rainfall distribution (1 gage per 225 sq mi). Research since 1949 on the use of 3 cm radar to detect and compile areal rainfall structure has yielded results comparable to those obtainable with a dense network of gages. Average thunderstorm diameter is 3 mi, so storms can easily slip unnoticed between stations 15 mi apart but cannot escape the radar if within 100 mi of the station. Comparison of radar catch with actual gage readings shown in table indicates some loss in actual depths recorded by radar owing to attenuation. Charts show results of compilations described. *Subject Headings:* **1. Radar rainfall measurement 2. Rain gage networks.**—*M.R.*

6G–175 551.577.1:551.501.81

Dennis, A. S., **Initiation of showers by snow.** *Journal of Meteorology*, 11(2):157–162, April **1954.** 6 figs., 9 refs. Also issued as: McGill Univ. Macdonald Physics Laboratory. Stormy Weather Research Group, Contract AF 19(122)-217, Scientific Report MW-14, June **1953. MH-BH, DWB**—Vertical radar photos at Montreal are given showing shower echoes associated with snow trails. Trails of snow can seed other clouds at a lower level by being entrained on upwind side. If tops of largest cumuli are at −3 to −12°C, this could initiate showers which otherwise would not occur. This theory is supported by observed radar patterns and by a three-dimensional analysis, leading to discontinuous patches of continuous precipitation. Synthetized plans show showers to be more frequent in regions of snow trails than elsewhere. (*Same item as* 5.8–205, Aug. 1954, *MAB.*) *Subject Headings:* **1. Precipitation formation 2. Radar analysis of precipitation 3. Montreal, Canada.**—*C.E.P.B.*

6G–176 551.501.81:551.578

Evans, Stanley F. and Stone, Melvin L. (*both M.I.T.*), **Notes on the effect of polarization on radar precipitation echoes.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Supplement to the Proceedings,** VII-8, pub. **1954.** 4 p. figs.) **DWB, DLC**—Experimental observations at the Telecommunications Research Establishment in England (1948–1950) with 3 and 10 cm radars are described briefly and accompanied by radar photographs, featuring effect on precipitation echoes by departing from plane polarization. Rain echoes on the S band had the most effective cancellation by using elliptical radiation of 1.6 to 1 horizontal. No marked change in snow echoes on X band, but some reduction in rain echoes on S band was found by comparing horizontal and vertical radiation. *Subject Headings:* **1. Radar precipitation echoes 2. Radar echoes from snow 3. England.**—*W.N.*

6G–177 551.501.81:551.576.11

Feteris, P. J., **Wolken waargenomen met radar.** [Clouds observed with radar.] *Hemel en Dampkring*, 52(12):221–229, Dec. **1954.** 9 figs. **MH-BH**—Various types of radar screen echoes as obtained in Holland are discussed and shown in photographs. They include echoes from alto-stratus clouds, warm-front precipitation and a storm squall. *Subject Headings:* **1. Radar cloud observation 2. Netherlands.**—*G.T.*

6G–178 551.501.81:551.576.11

*Frost, R., **Cumulus and cumulonimbus cloud over Malaya.** *Great Britain. Meteorological Office, Meteorological Reports*, 2(15), **1954.** 18 p. 2 figs., 9 tables, 14 refs. Its *M.O.* 535j. **GB-MO**—In 1950, flights with airborne radar were made through clouds over Malaya and Sumatra. Change from Cu to CuNb occurs at 30–33,000 ft, tops of CuNb ranged up to 54,600 ft (height of tropopause). Intensity of radar response is described. Hail was met in only 7 of 87 CuNb clouds, snow or sleet in 14 of 110, lightning in 35 of 110 flights. Highest gust 1.1g (49 ft/sec). Updraughts varied from +12 to −3 ft/sec in Cu and +21 to −6 in CuNb. Turbulent areas can be dodged by avoiding radar-response areas by a mile. Accelerometer records are shown and tabulated. Temperature within clouds was 0–6°C below environment. Comparisons are made with U. S. Thunderstorm Report. (*Same item as* 6.2–38, Feb. 1955, *MAB.*) *Subject Headings:* **1. Cloud structure 2. Radar analysis of clouds 3. Vertical velocities 4. Malaya.**—*C.E.P.B.*

6G–179 551.501.81:551.577:551.554

Gunn, K. L. S. and Marshall, J. S., **The effect of wind shear on falling precipitation.** McGill Univ. Macdonald Physics Laboratory, Contract AF 19(122)-217, Scientific Report MW-18, Dec. **1954.** 29 p. 16 figs., 13 refs., 5 eqs. **DWB**—This study analyzes some of the consequences arising from the sorting of raindrops in snowflakes by size during their fall through the wind shear that is usually present. In the case of showers, "the effect of shear on the average relationship between the important radar scattering parameter Z (the sum of the sixth powers of the particle diameters in unit volume) and R, the rainfall rate, and the effect on the size distribution on the ground" are considered. In the case of continuous rain, the shear sorting effects on these same quantities in the snow that melts to form such rain has been considered. *Subject Headings:* **1. Wind shear 2. Raindrop size distribution 3. Radar analysis of precipitation.**—*I.L.D.*

6G–180 551.57:551.501.81

*†Gunn, K. L. S. and East, T. W. R., **The microwave properties of precipitation particles.** *Royal Meteorological Society, Quarterly Journal*, 80(346):522–545, Oct. **1954.** 7 figs., 7 tables, 64 refs., 17 eqs. **DWB**—Advances in radar meteorology since the fundamental paper by J. W. Ryde (*see* 2H–84, Aug. 1951, *MAB*) are reviewed. The principles of radar analysis of precipitation are summarized. Pt. 2 tabulates the refractive index absorption coefficient, back scatter and attenuation of water and ice at different temperatures and wave-lengths (see also p. 539). Pt. 3 sets out the theory of scattering and absorption by spheres of water, ice and water-coated ice. In Pt. 4 scattering by rain is taken up. Determinations of constants in $Z = aR^b$ are quoted and scattering and attenuation of different wave-lengths shown. Scattering and attenuation by snow, wet snow (including origin of "bright band") and clouds are briefly considered. Appendixes take account of attenuation by air and water vapor and note errors in the literature. (*Same item as* 6.3–201, March 1955, *MAB.*) *Subject Headings:* **1. Radar analysis of precipitation 2. Microwave scattering.** —*C.E.P.B.*

6G–181 551.501.81:551.578.41

Gunn, K. L. S.; Langleben, M. P. and Dennis, A. S., **Radar evidence of a generating level for snow.** *Journal of Meteorology*, 11(1):20–26, Feb. **1954.** 8 figs., 4 refs. **MH-BH.** Also as: McGill Univ. Macdonald Physics Laboratory. Stormy Weather Research Group, Contract AF 19(122)-217, Scientific Report, ME-13, July **1953.** 17 p. figs., 3 refs. **DWB.** And in: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** v. 1: VII-4, pub. **1954.** 4 p. 6 figs., 2 refs. **DLC**—Precipitation patterns recorded in winter 1951–2 at Montreal are studied. Height of echo top in parabolic trail patterns generally agreed with "velocity height" of a generating element, showing that top of radar echo was moving with speed of wind at its level. Echo height also agreed with height of top of main middle cloud. In stable conditions echo top averaged 1700 ft above frontal surface. Intercorrelations, which are mostly above 0.85, are shown schematically. Relations to generation of snow crystals are discussed. Results point to long-lived snow generating elements in a shallow active layer of stratiform cloud across a frontal surface. (*Same item as* 5.9–38, Sept. 1954, *MAB.*) *Subject Headings:* **1. Radar analysis of snow 2. Montreal, Canada.**—*C.E.P.B.*

6G–182 551.501.81:551.501.7:551.507.352

Harrison, Henry T. (*United Air Lines*), **Highlights of United Air Lines weather radar evaluations.** *Weatherwise*, 7(4):92–95, Aug. **1954.** 13 figs. (incl. photos.). (See 6G–183 for similar article.) **MH-BH**—Describes and illustrates weather mapping radar installations (5.5 cm) used by United Airlines in 1953, and nicknamed "Sir Echo." From June through Sept. 1953, 40 flights were made (133 hrs of flying, 80 of which were in thunderstorm areas, with this equipment, using Denver as a base). Much hail, 5 tornadoes, and 4 "cloudbursts" were included in conditions covered by radar mapping. It was found that a pilot can make a detour around a storm after spotting it

at a distance of over 75 mi with minimum loss of flight time; or can choose a corridor of least turbulence or thunderstorm activity, with detours of 5 mi or less, and can give valuable information to planes not thus equipped. Other advantages are cited. *Subject Headings:* **1. Air-borne weather radar 2. Thunderstorm avoidance 3. United Airlines.**—*M.R.*

6G–183 551.501.81:551.515.4:551.507.352

Harrison, Henry and Post, Edgar A., **Evaluation of C band (5.5 cm) airborne weather radar.** Denver, Colorado, United Air Lines, Inc., March 1, **1954.** 108 p. 218 figs., 13 refs. **DWB**—This complete description of an air-borne radar unit is accompanied by an unusual amount of illustrations, most of which are radar screen photographs showing thunderstorm echoes. Operational details and results of flight tests made with the unit are discussed *in extenso.* At least 80 out of the 133 hours of flight were made under thunderstorm conditions, including thunderstorms of all types and sometimes associated with hail, tornadoes and cloud bursts. It is found that C-band radar will penetrate at least 15 mi of heavy rain (>60 mm/hr) and of hail shafts. It will also separate storm and terrain echoes. (*Same item as* 6.1–32, Jan. 1955, *MAB.*) *Subject Headings:* **1. Air-borne weather radar 2. Radar photographs 3. Radar precipitation echoes 4. Thunderstorm reconnaissance flights.**—*G.T.*

6G–184 551.501.81:621.396.029

Hitschfeld, Walter and Marshall, J. S., **Effect of attenuation on the choice of wave-length for weather detection by radar.** *Institute of Radio Engineers, Proceedings,* 42(7):1165–1168, July **1954.** 2 figs., 2 tables, 8 refs., 12 eqs. **DWB**—The performance of radars in storm detection is studied in a manner designed to help in the choice of the proper wavelength for the radar. Decreasing the wavelength increases the range in clear air, but the attenuation associated with the shortened wavelength cuts down appreciably the ability of the radar to look through intervening rain. It is concluded that for the certain detection of operationally significant storms, wavelengths shorter than about 5 cm should not be used. (*Same item as* 6.1–33, Jan. 1955, *MAB.*) *Subject Headings:* **1. Radar storm detection 2. Atmospheric attenuation 3. Radar wavelengths.**—*Authors' abstract.*

6G–185 551.501.8:551.515.3(773)

§Huff, F. A.; Hiser, H. W. and Bigler, S. G., **Study of an Illinois tornado using radar, synoptic weather and field survey data.** *Illinois. State Water Survey Div., Report of Investigation,* No. 22, **1954.** 73 p. 29 figs., 3 tables, 11 refs. **DLC**—A most thorough analysis of the meteorological factors attending the tornado of April 9, 1953 which passed just north of Champagne-Urbana, Ill., and of the radar (PPI) photographs which show a tail forming a distinctive curl and "eye" such as had never before been photographed on a radar scope. Not every such tail forms into a tornado curl and possibly numerous tornadoes would not appear as curls or tails on the PPI, but it does give an index to activity that coincided with the path of the tornado for a distance of 25 or 30 mi (dozens of PPI photos are included as well as synoptic charts, photos of damage, etc.). (*Same item as* 6.3–36, March 1955, *MAB.*) *Subject Headings:* **1. Radar analysis of tornadoes 2. Radar tornado photographs 3. Urbana, Ill.**—*M.R.*

6G–186 551.501.81:551.577

Hunter, I. M., **Polarization of radar echoes from meteorological precipitation.** *Nature,* London, 173(4395):165–166, Jan. 23, **1954.** table, ref. **DWB**—Describes and discusses measurements with a novel type of circularly polarized radar on 3.2 cm. *Subject Heading:* **1. Radar precipitation echoes.** —*C.E.P.B.*

6G–187 551.501.81:551.515.2:77

Hunter, Marvin N. (*U. S. W. B., National Airport, Wash., D. C.*), **Simple radar scope photography.** *Weatherwise,* 7(2):38–40, April **1954.** **DWB**—Expensive automatic radar-scope cameras usually interfere with visual observation of the screen, unless a second screen is available. A much more simple, cheap and effective system, which avoids the difficulty mentioned above is described and the results of photography accomplished during the passage of hurricane "Barbara" up the Atlantic coast from the Carolinas to New Jersey (Aug. 14, 1953) are illustrated. This new system made use of a Brownie target six-16 box type camera with fixed focus, using Super XX film and with a Kodak portrait lens (focal length 42") scotch-taped onto front of camera, and the whole mounted on a step-ladder set up at 3 ft from the screen, using a 10-second exposure (time for one complete sweep). Cost, about $12. (*Same item as* 6.3–38, March 1955, *MAB.*) *Subject Headings:* **1. Radar scope photography 2. Radar hurricane photographs 3. Hurricane "Barbara" (1953).**—*M.R.*

6G–188 551.501.81:551.515

Jones, Herbert L. (*Oklahoma A & M, Stillwater*), **Correlation between sferics and incidence of severe storms.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. **9–12,**

1953, **Supplement to the Proceedings,** V-1, pub. **1954.** 5 p. 12 figs. (incl. photos), ref.) **DWB, DLC**—Valuable information on existing meteorological conditions during severe storms was obtained in the Great Plains area (Oklahoma and Kansas) in the tornado season Feb.–July, 1953. The observations were conducted simultaneously by 3 cm radar, direction finder and the "Sferics incidence azimuth integrator"; the last a newly developed instrument. A squall line appearing solid on the radar screen was composed of separate storm centers, intensity of which controlled rate of arrival and increase of sferics. (Abstract of this article appeared in the **Proceedings of the Conference,** pub. 1953.) *Subject Headings:* **1. Radar storm detection 2. Radar weather instruments 3. Radar tornado detection 4. Sferics from tornadoes.**—*W.N.*

6G–189 551.501.81:551.594.221

Jones, R. F., **Radar echoes from lightning.** *Royal Meteorological Society, Quarterly Journal,* 80(346):579–582, Oct. **1954.** 8 figs., 9 refs. **DWB**—Photos are shown of radar echoes from lightning obtained at East Hill by pointing aerial nearly at top of CuNb echoing column. Heights ranged from 17,000 to over 30,000 ft, temperatures −29 to −46°C. It is suggested that many flashes originate at border of negatively charged columns of large particles. (*Same item as* 6.3–39, March 1955, *MAB.*) *Subject Headings:* **1. Radar analysis of lightning 2. Radar echoes from lightning.** —*C.E.P.B.*

6G–190 551.501.81:551.551:551.576.1

Jones, R. F., **Radar echoes from and turbulence within cumulus and cumulonimbus clouds.** *Great Britain. Meteorological Office, Professional Notes,* 7(109), **1954.** 19 p. 8 figs., 6 tables, 5 refs. At head of title *M.O.* 524i. **GB-MO**—Spitfires carrying accelerometers flew on selected tracks through clouds; simultaneous ground measurements of echo intensity were made. Frequency N per 1000 yards of gusts of 0.1 gn to 0.1 $g(n+1)$ in clouds giving echo was $5.46\times10^{-0.328n}$ and in clouds giving no echo $6.78\times10^{-0.363n}$. U. S. thunderstorm data gave $2.963\times10^{-0.279n}$. Variations of coefficients with height up to 40,000 ft are tabulated. Turbulence increases with height in CuNb nearly half way up cloud, remains constant up to top third and then decreases. Severity of turbulence is related to radar echo characteristics; it is greatest on edges of echoing volume. (*Same item as* 5.8–34, Aug. 1954, *MAB.*) *Subject Headings:* **1. Radar analysis of clouds 2. Cumulonimbus clouds 3. Turbulence.**—*C.E.P.B.*

6G–191 551.501.81:551.577

Jones, R. F., **Radar echoes from precipitation.** *Marine Observer,* 24(163):31–35, Jan. **1954.** 8 figs., 5 refs. **MH-BH**—Discussion of observations of precipitation by 3 and 10 cm radar illustrated by PPI and vertical cross-section photos. Interpretation of observations is discussed; radar supports origin of rain from ice-crystals when vertical currents are small, and by growth of raindrops in large vertical currents. (*Same item as* 5.9–39, Sept. 1954, *MAB.*) *Subject Heading:* **1. Radar precipitation echoes.**—*C.E.P.B.*

6G–192 551.501.81:551.577

Kiely, D. G., **Rain clutter measurements with C.W. radar systems operating in the 8 mm wavelength band.** *Institution of Electrical Engineering, Proceedings,* Pt. 3, 101(70):101–108, March **1954.** 7 figs., 8 refs. Also in: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** v. 1: I-7, pub. **1953.** 10 p. 4 figs., 9 refs., eqs. **DLC, DWB**—The objects of this work were to investigate the extent of rain clutter using 8-mm continuous-wave radar systems with both a single aerial (common transmission and reception) and dual aerials (separate transmission and reception) and to investigate the reduction of this clutter by orthogonal polarization techniques. In the common transmission and reception case using polarization duplexing, the amplitude of the rain clutter was measured in terms of decibels below the valve power level by a direct comparison method and plotted against the rainfall rate in mm per hour. This was also done for the separate transmission and reception case, which did not employ a duplexer. The results showed that the rain clutter amplitude in the common transmission and reception case was some 60 db below valve power level for a moderate rainfall of 3 mm/hr. In the separate transmission and reception case rain clutter decreased with increasing aerial spacing and was some 95 db below valve power for a rainfall rate of 3 mm/hr with 2-ft diameter aerials spaced 3 ft center to center. Details of the methods of measurements, the equipment used and the experimental observations are given. (*Same item as* 6.1–34, Jan. 1955, *MAB.*) *Subject Headings:* **1. Radar rainfall measurement 2. Radar wavelengths.**—*Author's abstract.*

6G–193 551.501.81:77

Le Page, L. S., **Photographing radar echoes.** *Marine Observer,* 24(163):33–24, Jan. **1954.** fig. **MH-BH**—Description of simple apparatus for photographing radar screen on board ship. *Subject Heading:* **1. Radar photographs.**—*C.E.P.B.*

6G–194 551.501.81:551.578.11

Lhermitte, R. (*Establissement d'Études et de Recherches Met., Paris*), **Étude au radar de la structure des précipitations.** [Study of the structure of precipitation by means of radar.] *Journal Scientifique de la Météorologie*, Paris, 6(21):17–35, Jan./March **1954.** 9 figs., 9 refs., 9 eqs. French, English and Spanish summaries p. 17. **DWB**—The vertical structure of the rain echoes has been studied with the aid of two radars on 3.2 c/m, simultaneously exploring the atmosphere in a vertical plane and in a horizontal plane. The recordings obtained on the indicators of these two radars have led to an interpretation of the aspect of the showers echoes with the assistance of a theory taking into consideration the falling speed of the rain drops and the variation of the speed of the wind in relation to the altitude. The mathematical development of the study of an extensive source shows that after a certain vertical distance covered, a group of heavy drops before or after the precipitation, depending on whether the wind increases of decreases with the altitude, is formed. This theory, applied to frozen particles falling slowly, has served as a basis for the explanation of the "upper bands." *Subject Headings:* **1. Rain structure 2. Radar studies of precipitation.**—*Author's abstract.*

6G–195 551.501.81:551.509.54:551.557

Ligda, Myron G. H. and Mayhew, William A., **On the relationship between the velocities of small precipitation areas and geostrophic winds.** *Journal of Meteorology*, 11(5):421–423, Oct. **1954.** 4 tables, 10 refs. **DWB**—Previous relations between movements of small precipitation areas ("spawinds") from radar PPI and atmospheric currents showed high correlation; LIGDA's 1953 data were accordingly analyzed by vector correlation of N–S and E–W components, giving coefficients of 0.85 and standard errors of estimate of 12 mi/hr. These compare favorably with balloon winds at 700 mb and may be useful in synoptic analysis. (*Same item as* 6.3–40, March 1955, *MAB.*) *Subject Headings:* **1. Radar observation of showers 2. Upper air analysis 3. Upper air winds.**—*C.E.P.B.*

6G–196 551.501.81:551.515

Ligda, Myron G. H. (*M.I.T.*), **Operational utilization of radar storm observations.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953. **Supplement to the Proceedings,** X-1, pub. **1954.** 6 p. 4 figs., ref.) **DWB, DLC**—Discusses methods applicable to forecasting and warning of storms and flash floods to be employed in military surface operations and civilian enterprises. Since time is an important factor not only in techniques and analysis but even more in communication, the Civilian Defense warning system may be utilized for dissemination. (Abstract of this paper appeared in **Proceedings of the Conference,** pub. **1953.**) *Subject Headings:* **1. Radar storm observation applications 2. Radar storm warning systems 3. Radar precipitation forecasts 4. Military meteorology.**—*W.N.*

6G–197 551.501.81:551.506

Lidga, Myron G. H., **The use of radar storm observations for weather forecasting.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Supplement to the Proceedings,** XI-1, pub. **1954.** 6 p.) **DWB, DLC**—This review of radar as a meteorological tool starts with its debut 10 years ago in Panama. Next comes a brief discussion on such topics as: 1) extrapolation, 2) basic research, 3) observation of state and modification of the atmosphere and 4) the radar network. Attempt is made to answer some of the questions that have been raised concerning use of radar observations for 6–24 hr forecasting. Expresses the desirability of more practical and improved ways of bringing radar-scientific results to the attention of the forecasters. (Abstract of this paper appeared in **Proceedings of the Conference,** pub. **1953.**) *Subject Headings:* **1. History of radar 2. Radar forecast 3. Radar storm detection networks.**—*W.N., M.R.*

6G–198 551.501.81:551.515.3

Long, Allen, **Radar spies on tornadoes.** *Science News Letter*, 65(7):106–107, Feb. 13, **1954.** fig. **DWB**—Description of Texas tornado warning network consisting of 16 rehabilitated radar sets that were outmoded for U. S. Weather Bureau aerological work. When severe storms are predicted for an area, the radars will be put into operation. Then when suspicious looking clouds appear on the radar screen the Weather Bureau will make long distance telephone calls to determine the exact nature of the storm and from then on the tornado cloud (if it occurs) will be tracked by radar and surface observations, with due warning given to areas in its immediate path. (*Same item as* 5.11–27, Nov. 1954, *MAB.*) *Subject Headings:* **1. Tornado warning networks 2. Radar tornado detection 3. Texas.**—*M.R.*

6G–199 551.501.81:551.515.3

Marshall, J. S., **Radar detection of tornadoes.** *Weatherwise*, 7(2):21, April **1954. MH-BH**—The identification of tornadoes by radar, though promising, is not conclusive, but the use of radar

networks to locate as early as possible the thunderstorms in a tornado danger area, so that these storms may be watched closely for signs of tornado development, does have possibilities. Sferics detectors can be used to supplement radar, as the sferics characteristic of tornado storms are different from ordinary thunderstorm sferics. The new radar tornado network in Texas is briefly described in an added note. (*Same item as* 6.5–43, May 1955, *MAB.*) *Subject Headings:* **1. Radar tornado detection. 2. Tornado warning networks 3. Sferics detection 4. Texas.**—*M.R.*

6G–200 551.594.7 551.501.81:551.577

Massachusetts Institute of Technology. Dept. of Meteorology, **Weather Radar Research.** Contract DA-36-039-sc-42625, Project DA 3-00-07-022, Project Sc 24-172b, Quarterly Technical Reports, No. 3–4, Dec. 15, **1953** and March 15, **1954.** 2 pieces. **DWB**—During the quarter ending Dec. 15, 1953, 17 weather situations were observed and results reported. Five of these were storms which yielded interesting results. Intensity and fluctuation rate measuring techniques were improved through construction of auxiliary apparatus and improvement of the radar turbulence meter. A program was begun for the variable polarization of the radar beam and its effect on precipitation echoes. During the quarter ending March 15, 1954 radar observation and measurements were made on 31 days and partially analyzed. (*Same item as* 6.5-351, May 1955, *MAB.*) *Subject Headings:* **1. Radar meteorology 2. Radar turbulence meters 3. Radar analysis of precipitation.** —*M.R.*

6G–201 551.501.81:551.577

Mathur, L. S.; De, A. C.; Dutta, B. N. and Mitra, H., **Radar echoes from monsoon rain.** *Indian Journal of Meteorology and Geophysics,* 5(2):173–186, April **1954.** 8 figs., ref., eq. **DWB**—A detailed description (with the aid of a photograph) of an air-borne radar set AN/APQ13 modified for storm detection work from a static station is described. The principal features of the radar equation are presented and the results of observations of radio echoes from monsoon rain made at New Delhi during Aug. 1952 are described. *Subject Headings:* **1. Radar precipitation echoes 2. Radar storm detection 3. New Delhi, India.**—*I.L.D.*

6G–202 551.501.81:551.577

Moore, R. K.; Altman, H. G.; Marrs, A. T. and Gragg, D. M. (*Sandia Corp., Albuquerque*), **Moisture content distribution and radar reflectivity in thunderstorms.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Supplement to the Proceedings,** VII-7, pub. **1954.** 13 p. 7 figs. (incl. photo), 2 refs., eqs.) **DWB, DLC**—Experimental data (±50%) of flights near freezing level during ordinary Gulf Coast thunderstorms (May, 1952) indicate a moisture content of from .3 to 2.4 gr/cu m and radar cross section indices between 1 and 40 mm 6/cu m. The method of extrapolation employed here appears reasonable. *Subject Headings:* **1. Radar observations 2. Radar moisture measurements.**—*W.N.*

6G–203 551.501.81

Plumb, H. T., **Radar.** *Mineralogical Society of Utah, News Bulletin,* 6(2):5–14, Oct. **1954.** diagrs. **DWB**—This is a popular explanation of history, function and application of the radar, including names and altitudes of the atmospheric layers. Brief information on electromagnetic wave ranges and frequencies are also given in accordance with propagation characteristics. *Subject Heading:* **1. History of radar.**—*W.N.*

6G–204 551.578.11:551.501.81

Rigby, E. Caroline; Gunn, K. L. S. and Hitschfeld, Walter, **Development during fall of raindrop size distributions.** McGill Univ. Macdonald Physics Laboratory. Stormy Weather Research Group, Contract AF 19(122)-217, Scientific Report MW-17, Jan. **1954.** 35 p. 12 figs., table, 14 refs. **DWB**—Statistical study of changes in raindrop size distribution and in the resulting radar echo in falling, due to collisions, evaporation and breakup. Both continuous rain and showery rain types are analyzed. Vertical motion of radar echoes and appearance on radar screen also considered. Appendix consists of a theoretical and empirical study of depletion of cloud through accretion by falling rain. Numerous detailed and carefully drawn graphs of distributions and related parameters are presented. (*Same item as* 6.5–252, May 1955, *MAB.*) *Subject Headings:* **1. Radar precipitation echoes 2. Radar vertical motion measurements 3. Cloud physics.**—*M.R.*

6G–205 551.501.81:656.6

Rodewald, Martin, **Niederschlagsbilder im Radargerät.** [Precipitation pictures on radar apparatus.] *Wetterlotse,* No. 76:185-194, Sept. **1954.** 7 figs. **DWB**—Movement on radar screen of showers may give warning of changes of surface wind direction, of rain or snow during loading or unloading, or of poor visibility due to tropical rain or snow. Radar may give warning of approach of a cold front, line squall or hurricane. Spiral traces in hurricane of Sept. 25, 1952, are reproduced. (*Same item as* 6.1–35, Jan. 1955, *MAB.*) *Subject Heading:* **1. Radar storm detection.**—*C.E.P.B.*

6G–206 551.501.81

Roll, Hans-Ulrich, **Wolken und Regen im Radar.** [Clouds and rain on radar.] *Wetterlotse*, 72:129–132, June **1954.** **DWB**—Explains that fog, cloud and sometimes even rain are not seen on the radar screen because as water drops reflect according to 6th power of their diameter, they must reach 1 mm (snow crystals, 1.5–3 mm) to be seen at 10 mi distance. (*Same item as* 5.10–28, Oct. 1954, *MAB.*) *Subject Heading:* **1. Radar observations.**—*C.E.P.B.*

6G–207 551.501.81:551.574.1:551.576.11

Cunningham, R. M. and Atlas, D., **Growth of hydrometeors as calculated from aircraft and radar observations.** (In: American Meteorological Society and Royal Meteorological Society, **Proceedings of the Toronto Meteorological Conference, Sept. 9–15, 1953,** pub. **1954.** p. 276–289. 13 figs., table, 7 refs.) **DWB**—Five cyclonic storms over New England, investigated by flight and ground-radar, are examined for cloud structure and height of hydrometeor growth, and cross-sections are given, with vertical profiles, surface and upper level charts. It is found that "most of the water for growth is derived from the upper levels in the advance portion of a storm, while near the center and to the rear of active storms, most of the water comes from the lower levels and generally from below the frontal surface." (*Same item as* 6.3–37, March 1955, *MAB.*) *Subject Headings:* **1. Cloud structure 2. Cloud physics 3. Radar cloud observation.**—*C.E.P.B.*

6G–208 551.501.81:551.515.4

Stambler, Irwin, **Panagra evaluates Bendix Radar.** *Aviation Age*, N. Y., 22(2):50–53, Aug. **1954.** photos. **DWB**—In addition to technical details of radar tested out in Panagra planes during over 500 regular flight hours, the article states that on several occasions pilots have flown through thunderstorm or squall-line areas between Miami and Panama, or Panama and Ecuador, without encountering turbulence or delay in flight due to attempt to circumvent the storm area. Pictures of PPI scope sequences made during flight through heavy thunderstorm activity illustrate value of radar in commercial planes. *Subject Headings:* **1. Radar thunderstorm detection 2. Airborne weather radar 3. Airways meteorology 4. Panama airways 5. Panama.**—*M.R.*

6G–209 551.501.81:551.515

Storm detecting radar at Dum Dum Airport. *Indian Journal of Meteorology & Geophysics*, Dehli, 5(3):279, 288, July **1954.** 2 figs. **DWB**—A Decca Storm-detecting radar, type 41, was installed at Dum Dum Airport on June 25, 1954 with scanner on roof 60 ft above ground to clear all obstructions. PPI scope with 12″ cathode ray tube is in briefing room of the Meteorological Office. Scanner comprises a parabolic reflector with 14 ft aperture. Radar operates around 9375 Mc/s with vertical beam width of 4° and horizontal beam width of 0.75°, and rotation rate of 5–6 rpm and tilting angle from 2° to 12°. Two pulse rates (2.0 and 0.2 microseconds) are employed for long range and short range storm detection, respectively. Range is 10, 25, 50, 100, 150 and 250 nautical miles. Receiver band width can be switched from 10 Mc/s to 4 Mc/s with change in pulse length. On June 25, 1954 radar pictures were taken of a shower at ranges of 25 and 50 mi (p. 288). *Subject Headings:* **1. Radar storm detection 2. Radar equipment 3. Radar photographs 4. Dum Dum Airport, India.**—*M.R.*

1955

6G–210 621.396.826:551.578

Johnson, John C., **The back-scattering coefficient of a spherical homogeneous mixture of ice and air at wavelengths between 1 and 10 centimeters.** *Journal of Meteorology*, 12(2):188–189, April **1955.** fig., 2 tables, 4 refs., 5 eqs. **DWB**—The back-scattering cross section per unit cross-sectional area of a spherical scatterer for different refractive indices is tabulated. The refractive indices of homogeneous mixtures of ice and air are given in relation to density, and it is shown that pure ice is a limiting case. *Subject Heading:* **1. Radar wave scattering.**—*C.E.P.B.*

6G–211 551.501.81:551.576

Ligda, Myron, G. H. (*M.I.T.*), **Precipitation echoes and clouds.** *American Meteorological Society, Bulletin*, 36(2):47–52, Feb. **1955.** 19 photos. **MH-BH**—When radar was first used, echoes caused by "weather" were called "cloud echoes." Later it was understood that hydrometeors such as rain, snow and hail particles caused the echoes, so the term "precipitation echoes" became standard. Now with more specialized radar equipment, cloud types (stratiform or convective) can be identified by type of echo pattern on PPI or RHI scopes, and with experience even more specific cloud types or even tornadoes can be identified. To stimulate such identification, a number of PPI photographs are paired with actual cloud photographs taken from the air at about the same time. More detailed records and better pictures are desired and coordination between ground radar crew and cameramen should be maintained. *Subject Headings:* **1. Radar echoes from clouds 2. Radar precipitation echoes 3. Cloud photography.**—*M.R.*

6G–212 551.594.7

†Marshall, J. S.; Hitschfeld, Walter and Gunn, K. L. S., **Advances in radar weather.** *Advances in Geophysics*, ed. by H. E. Landsberg, 2:1–56, **1955.** 29 figs., 4 tables, 130 refs., eq. **DLC**—A thorough review of the entire field of radar meteorology as applied to precipitation and storm detection, since the first published literature ca. 1945 (earlier reports were as rule restricted in circulation). Frequencies of 10 cm, 5.7 cm, 3 cm, 1.25 cm and 0.9 cm are in current use for various types of radar observation of continuous or showery rain, snow, hail, hurricanes, tornadoes, lightning, clouds, turbulence and humidity discontinuities (angels). The use of PPI and RHI scopes for detecting precipitation patterns, intensity, amount, height, fall velocity, freezing level, etc. and Rasaph (radar signal spectrograph) for turbulence or intensity fluctuation determinations are outlined, with numerous illustrations and summaries of data in tabular and graphic form. The theory and empirical confirmation of theory is developed; namely, the radar equation, back scattering, assemblies of particles, attenuation fluctuations, etc. The list of 130 references testifies to the authors wide acquaintance with the literature and to the fact that they have been in the forefront in this field almost since its inception. *Subject Headings:* **1. Radar weather studies 2. Review articles 3. Bibliography on radar cloud physics.**—*M.R.*

6G–213 551.501.81:551.578.41

Mason, B. J., **Radar evidence for aggregation and orientation of melting snow flakes.** *Royal Meteorological Society, Quarterly Journal*, 81(348):262–264, April **1955.** table, 8 refs., 3 eqs. **DWB**—J. W. Ryde's simple theory of the melting band (3 or 10 cm radar) predicts that the echo from melting snowflakes would be about 5 times stronger than the echoes just above and below. Observations show that the ratio is generally greater than 5. This is explained by aggregation of snowflakes in the melting zone and by the fact that scattering in the melting zone is greater than from spheres of equal volume. *Subject Heading:* **1. Radar precipitation echoes.**—*C.E.P.B.*

6G–214 551.501.81:551.577

Miles, V. G., **Resolution in height of a radar pulse.** *Journal of Meteorology*, 12(2):107–110, April **1955.** 8 figs., 2 refs., 10 eqs. **DWB.** (Also in: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, **Supplement to the Proceedings,** XII-8, pub. **1954.** 6 p. 6 figs., ref., 5 eqs.) **DLC**—In S. Rhodesia (18°S) the bright band echo was observed to split in two as the radar beam was deflected from the vertical. The echoes from two reflecting layers are analyzed and curves are obtained showing the degree of partial or complete resolution for different angles. *Subject Headings:* **1. Radar precipitation echoes 2. Bright band echoes 3. Southern Rhodesia.**—*C.E.P.B.*

6G–215 551.515.8:551.515.3:551.501.81

Penn, Samuel; Pierce, Charles and McGuire, James K. (*U. S. W. B., Boston, Mass.*), **The squall line and Massachusetts tornadoes of June 9, 1953.** *American Meteorological Society, Bulletin*, 36(3):109–122, March **1955.** 26 figs. (incl. photos), 4 refs. **MH-BH**—Some features of the squall line situation of June 9, 1953 and accompanying tornadoes in central and eastern Massachusetts are discussed. From radarscope photographs, it is pointed out (1) that the Worcester tornado and the Franklin-Wrentham tornado each occurred in the right-rear quadrant of a squall-line thunderstorm cell, and (2) that this relative position, with an associated tail or hook in the radar echo, is similar to that of the Illinois tornado of April 9, 1953. A tentative explanation is suggested for tornado formation in this position. *Subject Headings:* **1. Tornadoes 2. Line squalls 3. Radar echoes from tornadoes 4. Massachusetts.**—*Authors' abstract.*

6G–216 551.501.81

Weather radar in research and operations. *Meteorological Magazine*, London, 84(992):51–54, Feb. **1955.** 10 refs. **DWB**—The discussion was opened by W. G. Harper with a short survey of meteorological radar theory and practice and a description of recent development and research. He described the uses of radar in forecasting fronts and showers and investigating precipitation processes. A good discussion followed. (*Same item as* 6.6–42, June 1955, *MAB.*) *Subject Headings:* **1. Radar precipitation echoes 2. Radar storm detection. I. Harper, W. G.**—*C.E.P.B.*

6G–217 551.5:629.13:06 551.501.81

World Meteorological Organization. Commission for Aeronautical Meteorology, **Abridged Final Report of the First Session, Montreal, June 15–July 14, 1954,** vol. 2. *World Meteorological Organization, WMO*, No. 33, RP. 16, pub. Geneva, **1955**(?). Each section repaged. diagrs., forms. **DWB**—The WMO Commission for Aeronautical Meteorology met for a month at Montreal in 1954 and convened simultaneously with the Fourth Session of the Meteorological Division of ICAO. The details of 69 recommendations, as well as the names of delegates and observers from 26 countries, transactions, history, agenda, etc., are included in this standard type of report issued by the WMO Secretariat. Work covered communications, observations and networks, standards and procedures,

codes, administration and climatological matters. Under the latter heading a dozen or so types of climatic summaries for airdromes were recommended and samples given (in 3 languages) in the appendix. New types are tops of cloud layers, soil temperature and solar radiation; and summaries of pilot reports were recommended for future consideration. The use of 3–10 cm ground radar for determining location, structure and movement of precipitation areas and 1 cm radar for determining height or vertical distribution of clouds is recommended for airports; the scopes should be located in the meteorological offices. It is also recommended that the WMO Secretariat should be advised of location of ground radar weather reporting stations and also the performance characteristics of such equipment (Rec. No. 15 & 16, P.V.-8-10). An international code for such observations is recommended (No. 30, P.V.-20). A guide presenting all current knowledge of interpretation of radar weather echoes is recommended (No. 61, P.V.-40–41) and a classification scheme for types of echoes. *Subject Headings:* **1. WMO. Commission for Aeronautical Meteorology 2. Ground weather radar 3. Montreal, Canada.**—*M.R.*

SUPPLEMENTARY MATERIAL

6G–218 551.501.81:551.576.11

Bemis, Alan C., **The role of melting snow in the atmosphere.** *Journal of Meteorology*, 12(2): 186–188, April **1955.** fig., 7 refs. **DWB**—Radar studies with RHI scopes of 3-phase cloud systems where the bright band appears at or below the "melting level," give better knowledge of the structure of such clouds and lead to the conclusion that precipitation particles are modified in several ways by the melting process (coalescence, fall velocity, distribution of electric charges, evaporation rate, wind shear, turbulence). Lapse rates will be lessened in the melting zone but steepened directly beneath and the zero isotherms will be depressed (toward the ground), and the wind will become more turbulent beneath (with less shear) and more stable in the bright band area, with greater shear. The wind shear may initiate vertical motion. Resulting structures (cellular or banded) can be observed with radar. (*Same item as* 6F–350, June 1955, *MAB.*) *Subject Headings:* **1. Radar analysis of clouds 2. Bright band areas.**—*M.R.*

6G–219 551.501.81:551.576.1

Donaldson, Ralph J., Jr., **The measurement of cloud liquid-water content by radar.** *Journal of Meteorology*, 12(3):238–244, June **1955.** 6 figs., 4 tables, 12 refs., 22 eqs. **DWB**—A method is developed for correcting radar determinations of liquid water content in a cloud for attenuation of wave-lengths of 0.86, 1.25 and 3.2 cm, and its limitations are discussed. The 0.86 cm radar is best for cloud detectability in nearly all commonly encountered values of liquid water content but for detecting dense clouds over long paths or through rain a high-power 3.2 cm system is recommended. *Subject Headings:* **1. Radar cloud detection 2. Liquid water content of clouds.**—*C.E.P.B.*

6G–220 551.501.81:551.578.41

Douglas, R. H. and Marshall, J. S., **The convection associated with the release of latent heat of sublimation.** McGill University. Macdonald Physics Laboratory. Scientific Report MW-19, Contract AF 19(122)-217, Dec. **1954.** 31 p. illus., graphs, diagrs., 10 refs. **DWB**—A possible explanation is given for radar observations which indicate that snow develops in compact cells of the order of a few thousand feet in height in the atmosphere. Growing crystals impart latent heat to the surrounding air, and the increased temperature contributes to substantial updrafts. At the edge of a cloud with growing ice crystals, vertical velocity gradients and turbulence will occur. Such boundary regions may provide the basis of snow-generating cells observed by radar. *Subject Headings:* **1. Radar analysis of snow 2. Snow crystal formation.**—*SIPRE abstract.*

6G–221 551.501.81 621.826

Frühauf, Hans, **Über den Stand der Radartechnik.** [On the present position of radar technique.] *Forschungen und Fortschritte*, 29(5):129–136, May **1955.** 17 figs., 7 refs. **DLC**—The history of high frequency radio technique is summarized and the principle of radar echoes explained. Numerous applications are described and illustrated, including a radar picture of a rainsquall. *Subject Heading:* **1. Radar.**—*C.E.P.B.*

6G–222 551.501.81:551.515.2

Hatakeyama, H.; Imai, I. and Masuda, Y. (*all, Met. Res. Inst., Tokyo*), **On some radar observations of Typhoon "Lorna."** (In: *UNESCO Symposium on Typhoons, Tokyo, Nov. 9–12, 1954, Proceedings*, pub. **1955.** p. 121–128. 15 figs., 3 refs., 2 eqs. **DWB**—Analysis of surface wind data and radar photographs of Typhoon "Lorna" revealed discrepancies between the barometric center, the center of circulation and the center of the eye. These discrepancies are explained by

assuming that the typhoon is a normal cyclone. Radar photographs of this typhoon and surface streamlines are presented. *Subject Headings:* **1. Radar observation of typhoons 2. Typhoon "Lorna" (1954).**—*Based on authors' abstract.*

6G–223 551.501.81

International Civil Aviation Organization, Montreal, **Airborne weather radar.** Its *ICAO Circular*, 42-AN/37, **1955.** 18 p. 27 refs. **DWB**—The fundamental principles of radar are reviewed and their application to detection of icing, turbulence or heavy rain areas which might be avoided by slight deviations in the course of a plane in flight, outlined. Types of equipment (PPI, RHI and A-scope) or preferable wave lengths (5.7 cm recommended over 10 cm. or 3.2 cm.), use in cloud detection (0.9 cm band is best for cloud detection), the bright band, the "upper band," lightning as well as turbulence and rainfall intensity, manufacture of airborne equipment and future action proposed for the 4th session of ICAO, Meteorological Division are described. It is agreed that the basic use of airborne radar is for cockpit display of hazardous weather and that other uses such as collision avoidance are secondary. *Subject Headings:* **1. Air-borne weather radar 2. "Upper band" radar echoes.**—*M.R.*

6G–224 551.501.81

Johnson, Russell H. (*Air Weather Service*), **New Air Force weather equipment.** *Weatherwise*, 7(4):82–85, 102–103, Aug. **1954.** 5 figs. (inc. photos.) **MH-BH**—Radar storm detection equipment AN/CPS-9 for ground installations, is described as to its components, its technical characteristics, installation criteria, and uses in observation and forecasting. The transmissometer AN/GMQ-10, to obtain better horizontal visibility on runways, was developed by the Bureau of Standards for the Air Weather Service. Definitions of terms used in connection with visibility measurements are given. The Air Weather Service plans to install 20 of the transmissometers in the U. S. and overseas. The projector and receiver are located 500 ft apart, adjacent to the runway at the touchdown point. Advantages lie in constant recording, objectivity, location, and accuracy. *Subject Headings:* **1. Meteorological instrument development 2. Transmissometers 3. Radar storm detection equipment.**—*M.R.*

6G–225 551.501.81:35

†*Ligda, Myron G. H., **Proposed radar storm warning service for army combat operations.** *U. S. Air Force, Cambridge Research Center, Air Force Surveys in Geophysics*, No. 54, Aug. **1954.** 74 p. tables, 19 figs. (incl. photos), 13 refs. **DWB**—Radar storm observation techniques and reporting, meeting standards of rigid military requirements and tactical utilization, are described here. The report is based on earlier experiences further developed during the military operations in Korea, summer of 1953. Storm reports transmitted to assigned forecasters will enable determination of military activities based on the meteorological conditions at a given time on a given battlefield. Some practical suggestions are outlined. *Subject Headings:* **1. Radar storm warning systems 2. Military meteorology.**—*W.N.*

6G–226 551.594.22:77:551.501.81

Lightning photographed by radar camera. *South African Journal of Science*, Johannesburg, 50(12):309, July **1954.** **DWB**—A radar camera built by F. J. Hewitt, head of Teleum Research Laboratory of CSIR, in conjunction with B. F. J. Schonland, Director of Bernard Price Institute, takes 1000 pictures in $\frac{1}{2}$ sec. and is used to photograph electric activity inside a cloud when lightning occurs. Echoes coming from 4–8 mi in height and at a speed of 15 mi/sec. may come from junction streamers which link new sources of charge with multiple strokes which make up the main flash of lightning. *Subject Headings:* **1. Lightning photography 2. Radar photography of lightning 3. South Africa. I. Schonland, B. F. J. II. Hewitt, F. J.**—*M.R.*

6G–227 551.501.81:551.515.3

Radar tracks an Illinois tornado. *Weatherwise*, 6(3):76–77, June **1953.** photo. **MH-BH**—Three remarkable radar photographs taken at 1716, 1719 and 1733 h on April 9, 1953 at the Radar Meteorology Station of the Illinois State Water Supply near Champaign, Ill., show what appears to be the tornado vortex appendage to a rapidly moving (50 mph) thunderstorm in 3 stages of its development. A destructive tornado actually was reported at the time and place shown by the series of time lapse photos from which these were selected. The echo seems to be larger on a horizontal scale than the tornado itself could have been. (*Same item as* 5.9–42, Sept. 1954, *MAB.*) *Subject Headings:* **1. Radar photographs 2. Tornado appendages 3. Tornado tracking 4. Champaign, Illinois.**—*M.R.*

6G–228 551.501.81:551.515.4(73)

Stambler, Irwin, **RCA readies C-band.** *Aviation Age*, N. Y., 22(4):62–67, Oct. **1954.** illus. **DWB**—Discussion of problems involved in use of recommended 5.7 cm band for radar storm de-

tection from aircraft. Map of United States shows airline thunderstorm accidents for 1938–53. Hail damage is confined to area just east of Rocky Mountains. Examples of tests made by pilots of United Airlines are cited. *Subject Headings:* **1. Radar thunderstorm detection 2. Airborne weather radar 3. Thunderstorm frequencies 4. United States.**—*M.R.*

6G–229 551.501.81:551.515.3(08)

U. S. Weather Bureau, **Panel discussion of tornado problems held at the 133rd National Meeting of the American Meteorological Society in Miami, Florida, Nov. 18, 1954.** C. F. Van Thullenar, moderator. Wash., D. C. Feb. **1955.** 58 p. 14 figs. (incl. photos). **DWB**—The discussion given here by the 13 panel members listed, resulted in a general agreement on the need for improved methods of tornado observations, particularly instrumental ones aimed at (1) the tornado itself and (2) the atmosphere enclosing its breeding place. Radar observations and new electronic equipment, such as the "Tornado meter" and the "Black box," promise increased knowledge of atmospheric instability and structure generally assumed to provide the trigger necessary for tornadoes and other severe storms. *Subject Headings:* **1. Radar tornado detection 2. Tornado symposia. I. American Meteorological Society II. Van Thullenar, C. F.**—*W.N.*

6G–230 551.501.81:551.577

Atlas, David and Paulsen, Wilbur H. (*both, U. S. A. F. Cambridge Res. Center*), **Note on precipitation trajectories and radar patterns.** *Radar Weather Conference, 3rd, McGill Univ., Montreal, Sept. 15–17, 1952, Proceedings*, pub. **1952.** p. A-45 to A-47. 3 figs., ref. **DWB**—A simplified technique is presented for the generation of particle trajectories and space or time radar patterns in an arbitrary wind field. Interest is centered in the case of a generating element moving faster than the wind, such as that associated with wave motions and it is shown that a number of clouds and precipitation streamers (such as that from cirrus) must have been generated in this way. *Subject Headings:* **1. Radar precipitation movement studies 2. Radar techniques.**—*Authors' abstract.*

6G–231 551.501.81:621.396.8:551.577

Atlas, David and Plank, Vernon G. (*both, U. S. A. F. Cambridge Res. Center*), **The starting transient of a shower.** *Radar Weather Conference, 3rd, McGill Univ., Montreal, Sept. 15–17, 1952, Proceedings*, pub. **1952.** p. D–37 to D–39. 2 figs., 3 refs. **DWB**—A sequence of five closely spaced raindrop samples taken at the onset of a shower each displayed approximate monodispersity and drops decreasing to drizzle size with time. Correlation of median volume diameter and Z with rain intensity agree satisfactorily with empirical relations established for steady state rain except for the very first drops. It is suggested that such a drop size history may be due to the generation of particles at very nearly the same time at a wide range of altitudes with the highest ones becoming the largest at the ground due to growth by coalescence with cloud. *Subject Headings:* **1. Radar signal intensity (Z-values) 2. Rainfall intensities 3. Raindrop size distribution.**—*Authors' abstract.*

6G–232 551.501.81:551.574.1

aufm Kampe, H. J. and Weickmann, H. K. (*both, Signal Corps Engineering Labs., Ft. Monmouth, N. J.*), **Particle size distribution in different types of clouds.** *Radar Weather Conference 3rd, McGill Univ., Montreal, Sept. 15–17, 1952, Proceedings*, pub. **1952.** p. B-9 to B-12. 8 figs. **DWB**—Cloud spectra collected in different types of clouds are presented. Cumulus, stratocumulus and altocumulus have a narrow and fairly symmetrical spectrum, whereas cumulus congestus, cumulus nimbus and stratus type clouds show a spectrum which is extended toward larger droplets. This makes them more suitable for radar observation. Cirrocumulus has larger ice crystals than cirrostratus and therefore the former can be seen better than the latter. *Subject Headings:* **1. Radar cloud physics research 2. Radar analysis of clouds.**—*Authors' abstract.*

6G–233 551.501.81:551.577.2

Austin, Pauline and Richardson, Carl, **A method of measuring rainfall over an area by radar.** *Radar Weather Conference, 3rd, McGill Univ., Montreal, Sept. 15–17, 1952, Proceedings*, pub. **1952.** p. D-13 to D-20. 5 figs., 4 refs., eqs. **DWB**—The Pulse Integrator is an instrument which has been used for the quantitative measurement of the radar signal intensity from precipitation at a given point. It has now been adapted for the measurement of rainfall over a large area. The method employed involves the measurement of a single average radar signal from an area which may be as great as 100 sq mi. The relation between this average radar signal and the average rainfall rate over the area is deduced from observed variations in drop size distributions and from the comparison of radar signal intensity with rain rate at a given point. An example of the measurements obtained by this method is presented. *Subject Headings:* **1. Radar areal rainfall measurement 2. Pulse integrators.**—*Authors' abstract.*

6G–234 551.501.81:551.577.1

Bartnoff, Shepard (*Tufts College*); Atlas, David and Paulsen, Wilbur H. (*both U. S. A. F Cambridge Research Center*), **Experimental statistics in cloud and rain echoes.** *Radar Weathe Conference, 3rd, McGill Univ., Montreal, Sept. 15–17, 1952, Proceedings*, pub. **1952.** p. G-1 to G-7 5 figs., table, 7 refs., 4 eqs. **DWB**—An attempt has been made to verify the theoretical fluctuation in the radar echoes from clouds and rain. Two sets of 1850 pulses each from adjacent pulse volume in space were measured and analyzed. The following factors were considered: (1) The frequency distribution of echo intensity. (2) The development of criteria to establish the period for rea changes in the target configuration, with special application to turbulence. (3) The time required between successive radar pulses for the echoes to yield independent values. (4) The probability distribution for the averages of groups of pulses. (5) The confidence limits for determining the mean intensity by counting the number of pulses above a given threshold, and (6) Confidence limits for the various distributions. In general, the experimental results were in close agreement with theory *Subject Headings:* **1. Radar precipitation echoes 2. Radar echoes from clouds 3. Radar wave attenuation.**—*Authors' abstract.*

6G–235 551.577.11:551.576.

†Battan, Louis J., **Observations on the formation and spread of precipitation in convective clouds.** *Journal of Meteorology*, 10(5):311–324, Oct. **1953.** 12 figs., 5 tables, 36 refs. **MH-BH** Summary in *Radar Weather Conference, 3rd, McGill Univ., Montreal, Sept. 15–17, 1952, Proceedings* pub. **1952.** p. A-9 to A-16. **DWB**—Radar data in Ohio from the Thunderstorm Project in summe 1947 are used to study the formation of precipitation in all-water convective clouds. It is found that nearly 60% of tops of echoes first appeared at temperatures above 0°C, the contours of echo intensity extending upwards with time. It is shown that in middle latitudes precipitation is fre quently initiated by a process involving only liquid droplets formed on condensation nuclei. (*Same item as* 5.3–257, March 1954, *MAB.*) *Subject Headings:* **1. Precipitation formation 2. Cumulus clouds.**—*C.E.P.B.*

6G–236 551.501.81:551.57

Blanchard, Duncan C. (*Woods Hole Oceanogr. Inst.*), **Radar reflectivity and drop size distribution in the Pacific north east trades.** *Radar Weather Conference, 3rd, McGill Univ., Montreal, Sept. 15–17 1952, Proceedings*, pub. **1952.** p. D-29 to D-36. 2 figs., table, 8 refs. **DWB**—The production o rain from non-freezing clouds is an established fact. Meteorologists interested in the radar aspect of the problem will have to consider the mechanism of the origin of this type of rain which occurs over large areas of the earth's surface. The maximum sizes of drops from semi-tropical orographic clouds are considerably smaller than those usually found in rains of equal intensity in the temperate regions. The large numbers of small drops give high values of liquid water content W and correspondingly low radar reflectivity Z. Both W and Z have been found to vary within a single cloud system, the amount and direction of variation being dependent on the distance from the windward edge of the cloud. *Subject Headings:* **1. Radar rain observations 2. Radar echoes from non-freezing clouds 3. Precipitation physics.**—*Author's abstract.*

6G–237 551.515.13:551.501.8

§Boucher, Roland J.; Putnins, Paul H.; Webber, John P. and others, **Radar-synoptic investigation of the rainstorms of November 23 and 25, 1953 in the Boston Area.** *Blue Hill Meteorological Observatory, Meteorological Radar Studies*, No. 1, March 11, **1955.** 22 figs., charts, 3 refs. **DWB**— Two similar heavy rainstorms are investigated by means of radar and detailed synoptic analyses Significant features of the small scale pattern of precipitation as revealed by the radar are related to the larger scale features of the synoptic pattern. Two squall lines, one discovered by radar appear dynamically related to jet streams. The rate of growth of precipitation particles deduced from measurements of echo intensities suggests that updraft velocities of 30 to 70 cm sec^{-1} are required for an observed precipitation rate of 0.3 in. hr^{-1}. *Subject Headings:* **1. Radar analysis of rain 2. Radar squall line detection 3. Radar precipitation echo intensities 4. Boston, Mass.**— *Authors' abstract.*

6G–238 551.574.1:551.501.8

Browne, Ian C. and Wexler, Raymond, **The collection efficiency of ice crystals.** *Royal Meteorological Society, Quarterly Journal*, 79(342):549, Oct. **1953.** **DWB**—Comments on discussion of paper by R. Wexler, "Theory of radar upper band" (*see item* 3.10–36, Oct. 1952, *MAB*) and reply by Wexler. (*Same item as* 5.3–241, March 1954, *MAB*). *Subject Headings:* **1. Bright band echoes 2. Radar analysis of precipitation.**—*C.E.P.B.*

6G–239 551.577.11:551.576.11:551.501.8

Byers, Horace R., **Geographical differences in cloud populations.** *Archiv für Meteorologie Geophysik und Bioklimatologie, Ser. A*, 8(3):180–184, **1955.** 2 tables, 9 refs. English, German and

French summaries p. 180–181. **DWB**—The Cloud Physics Project at Univ. Chicago has been studying droplet growth in cumulus by radar and by special flights, to learn the local conditions under which rain is precipitated. Over sea round Puerto Rico (499 clouds) none with tops below 5000 ft gave echoes, the percentage increasing to 100 above 11,500 ft. All tops as low as 5°C gave echoes. Freezing level was 12–14,000 ft. Over the island (191 clouds) no echoes were received with tops below 7000 ft and only 44% above 12,000 ft. In New Mexico echoes only form when cloud top is much below freezing. The differences are attributed to slow growth of cloud over sea, giving time for coalescence, compared with heated land, and to the presence of numerous giant nuclei over the sea. *Subject Headings:* **1. Radar cloud physics research 2. Precipitation physics 3. Puerto Rico. I. Chicago Univ., Cloud Physics Project.**—*C.E.P.B.*

6G–240 551.577.1:551.574.1

Byers, Horace R.; Battan, Louis J. and Braham, Roscoe R., Jr., **Observations and measurements on natural and artificial rain from convective clouds.** (In: American Meteorological Society and Royal Meteorological Society, **Proceedings of the Toronto Meteorological Conference, Sept. 9–15, 1953,** pub. **1954.** p. 262–268. 5 figs., 2 tables, 9 refs.) **DWB**—Radar measurements show that in Ohio and Illinois (humid) precipitation is initiated at temperatures above ice-phase. In arid New Mexico echoes came only from cloud tops below −12°C and mostly below −24°C. If artificial nucleation requires supercooling, suitable clouds are rare in eastern U. S. Size distribution of sodium chloride particles was measured in Illinois, showing less than $1/m^3$ outside nuclei ($>60\mu$) so that giant sea salt nuclei cannot initiate precipitation in warm clouds. (*Same item as* 6.3–256, March 1955, *MAB.*) *Subject Heading:* **1. Precipitation formation.**—*C.E.P.B.*

6G–241 551.501.81:551.574.1

Cunningham, Robert M. (*M.I.T.*), **Precipitation mechanisms within the storm of 3 April 1951.** *Radar Weather Conference, 3rd, McGill Univ., Montreal, Sept. 15–17, 1952, Proceedings,* pub. **1952.** p. A-17 to A-32. 4+figs., ref., 3 eqs. **DWB**—By combining observations from an extensively instrumented airplane and powerful ground weather radar sets, conclusions are drawn concerning the distribution of hydrometeors around the cyclone studied and the relative importance of various precipitation mechanisms in the storm. The extensive observational material on this storm is summarized. The synoptic picture, the radar picture PPI and RHI, the ground precipitation pattern, and ground raindrop size distribution are discussed. A simplified cross section and plan view of the storm is drawn largely from the airplane observations. The principal cloud mass was found to be a large column of As and Cs to the north of the low extending to great heights and producing comparatively steady rain. This cloud mass ended abruptly along a WNW–ESE line just north of the surface low. Only the medium and low level clouds are shown to be associated with the surface frontal patterns. Results of aircraft measurements and numerical integration of a number of growth equations are shown for three characteristic portions of the storm. It was found that in the "steady" rain most of the growth was due to snow agglomeration while the clouds at moderately high levels supplied most of the water for the particle growth. In the southern portions of the low in the more showery precipitation, only one-fifth of the growth was due to ice crystal accretion, while four-fifths was due to a coalescence in the low level dense water clouds. *Subject Headings:* **1. Radar cloud physics research 2. Radar analysis of precipitation.**—*Author's abstract.*

6G–242 551.501.81:551.515.3

Ewing, Ann, **Tornado season here.** *Science News Letter,* Wash., D. C., 67(11):170–171, March 12, **1955.** illus. **DLC**—This is a popular explanation of the life cycles, detection and precautionary measures against tornadoes in Texas and neighboring states. Modified radars are used in detecting and tracking squall lines. Sferics from lightning reveals the location of the storm by the triangulation method. Variographs are used to check the sudden barometric pressure jump preceding and assumed to be the "trigger" of tornadoes of which 68% occur between March and June. *Subject Headings:* **1. Radar storm detection 2. Tornadoes 3. Radar networks.**—*W.N.*

6G–243 551.501.81:551.508.762

Fisher, Francis W.; Gould, William B. (*both, Signal Corps Engineering Labs.*) and Greenslit, Charles L. (*Bendix Radio Div.*), **Radar cloud base and top indicator.** *Radar Weather Conference, 3rd, McGill Univ., Montreal, Sept. 15–17, 1952, Proceedings,* pub. **1952.** p. E-1 to E-8. 9 figs. **DWB**—A brief historical outline of the Radar Cloud Base and Top Indicator Program is presented. An original equipment operating at a wavelength of 1.25 cm was built at Evans Signal Laboratory in 1946. The success of this venture resulted in a contract being let to Bendix Radio Division, Bendix Aviation Corp. for two models of a cloud detector operating at a shorter wavelength. Due to the specialized nature of the equipment and the newly explored wavelength, new techniques were

necessary. The operational results of these experiments have surpassed the performance of the original equipment. Although not all cloud types are detected with the reliability desired, a program for improved components and techniques will result in a cloud detector of even greater utility. *Subject Headings:* **1. Radar cloud base and top indicator 2. Radar cloud detectors.**—*Authors' abstract.*

6G–244 551.594.7

Freeman, John C., Jr. (*Cook Research Labs.*), **Unitary representation of radar cloud and precipitation data.** *Radar Weather Conference, 3rd, McGill Univ., Montreal, Sept. 15–17, 1952, Proceedings*, pub. **1952.** p. E-29 to E-32. 4 figs., ref. **DWB**—A unitary number system, proposed by BELLAMY, is used to demonstrate the feasibility of plotting height time sections of radar cloud data and to illustrate radar data in area and time. *Subject Headings:* **1. Radar meteorology 2. Radar meteorology classification systems.**—*Author's abstract.*

6G–245 551.594.7:621.396.029.6

Gerhardt, J. R. (*Texas Univ., Elec. Engr. Res. Lab.*), **Inhomogeneities in the atmosphere.** *Radar Weather Conference, 3rd, McGill Univ., Montreal, Sept. 15–17, 1952, Proceedings*, pub. **1952.** p. F-9 to F-16. 9 figs., 4 refs. **DWB**—A brief review is presented of the requirements of direct measurement of the profiles and small scale gradients of atmospheric index-of-refraction as a prerequisite to the interpretation and explanation of scattering, reflection and refraction of microwave radio energy. The development of an essentially instantaneous direct reading instrument for the observation of these profiles and fluctuations has made possible the first quantitative measurements of the atmospheric factors influencing radio propagation. Summary results and selected examples are presented of a series of surface and upper air observations of air temperature and refractive index. While general conclusions and correlations of observed data with general weather patterns cannot as yet be made, amplitude and frequency of fluctuations of refractive index generally decrease with height. Exceptions based on the presence of large scale horizontal gradients in the atmosphere are as much the rule, however, as the norm. *Subject Headings:* **1. Microwave propagation 2. Radar meteorology 3. Refractive index.**—*Author's abstract.*

6G–246 551.501.81:551.577 551.501.81:551.576

Gordon, Wm. E. (*Cornell Univ.*), **A comparison of radio scattering by precipitation and by turbulent atmosphere.** *Radar Weather Conference, 3rd, McGill Univ., Montreal, Sept. 15–17, 1952, Proceedings*, pub. **1952.** p. F-17 to F-24. 4 figs., 6 refs., 5 eqs. **DWB**—Observed radio field strengths exceed those predicted by standard theory at frequencies above about 30 Mc and range somewhat beyond the horizon. These fields have been attributed to radio scattering by a turbulent atmosphere. To assess the contribution to the observed fields from scattering by falling rain or water droplets in clouds, the ratio of scattering cross sections of water drops and a turbulent atmosphere is evaluated. It is concluded that radio scattering by falling rain will give an appreciable contribution to the observed fields, whereas scattering by droplets in clouds will not enhance the observed fields. *Subject Headings:* **1. Radar signal intensity 2. Radar precipitation echoes 3. Radar echoes from clouds.**—*Author's abstract.*

6G–247 551.501.81:551.57

Gunn, K. L. S. and East, T. W. R. (*both, McGill Univ.*), **The microwave properties of precipitation particles.** *Radar Weather Conference, 3rd, McGill Univ., Montreal, Sept. 15–17, 1952, Proceedings*, pub. **1952.** p. F-1 to F-8. 4 figs., 10 refs., eqs. **DWB**—The back-scatter and attenuation of microwaves of spherical particles can be computed exactly from formulas first derived by MIE. Using these formulas with the measured characteristics of rain showers, the empirical relation has been found that attenuation by rain is proportional to rainfall rate R (as suggested by RYDE) at 10 cm and at 9 mm wavelength, but to $R^{1.3}$ at 3 cm wavelength. The much simpler "Rayleigh" approximate formulas can be applied to both back-scatter and attenuation in the case of clouds and to back-scatter from rain at wavelengths 3 cm and longer with good approximation. A small ice sphere coated thinly with water will scatter nearly as well as a water sphere of the same volume and may absorb better. A small water spheroid would scatter and absorb more strongly than a water sphere of the same volume by factors which reach 80 or more for extreme shapes. Making the assumptions (1) that large spheroids have shape factors similar to those for small ones, and (2) that a water coating makes an ice spheroid behave like a water spheroid of the same size and shape, a water coating on ice clouds and snow must make them behave like water clouds and rain with shaped drops. Then the scattering by melting snow will be greater than by the resulting rain and attenuation in wet snow or by watercoated ice clouds will exceed considerably that in rain or water cloud. *Subject Headings:* **1. Hydrometeors 2. Radar precipitation echo intensities.**—*Authors' abstract.*

6G–248 551.501.81:551.577

Gunn, K. L. S. and Marshall, J. S. (*both, McGill Univ.*), **Effect of wind shear on falling precipitation.** *Journal of Meteorology*, 12(4):339–349, Aug. **1955.** 16 figs., 15 refs. **DWB**—Some consequences arising from size sorting are analyzed. The effect of shear on the average relationship between the radar scattering parameter of precipitation (z) and the precipitation rate (R) of showers and the effect on size distribution at the ground is considered. R and Z tend to be less at ground than in the generating region; size distribution remaining the same except for upper and lower limits of size imposed by the sorting. Several values of R and Z, all obeying $Z = aR^b$ are considered. Findings regarding an isolated shower agree with those of ATLAS and PLANK (1953). The shear-sorting effects on the same quantities in the snow that melts to form such rain are also considered. *Subject Headings:* **1. Radar analysis of precipitation 2. Radar rain observations 3. Radar signal intensity (Z-values).**—*From authors' abstract.*

6G–249 551.501.81:551.577

Higgs, A. J., **Radar echoes from meteorological particles.** *Radar Weather Conference, 3rd, McGill Univ., Montreal, Sept. 15–17, 1952, Proceedings*, pub. **1952.** p. F-29 to F-31. 3 figs. **DWB**—A momentary increase in the reflection coefficient of ice particles as they begin to melt is predicted theoretically, and confirmed by experiment. *Subject Headings:* **1. Radar signal intensity 2. Hydrometeors 3. Bright band echoes.**—*Author's abstract.*

6G–250 551.501.81

Hitschfeld, Walter (*McGill Univ.*), **Detectability of threshold echoes.** *Radar Weather Conference, 3rd, McGill Univ., Montreal, Sept. 15–17, 1952, Proceedings*, pub. **1952.** p. G-15 to G-18. 2 figs., 2 refs., eqs. **DWB**—If the average of several, say k, radar-intensities (due to noise+fluctuating echo or noise alone) is greater than the mean noise intensity, there is a definite probability that an echo is being received. On the basis of the probability distribution of the average of k independent signals, the confidence with which the existence of an echo can be asserted, may be computed. If the long-term mean echo intensity is known as a fraction of the mean noise intensity, the probability of obtaining a radar signal (i.e. echo+noise) greater than any given value b can be computed. This probability, in conjunction with the confidence in the existence of an echo inspired when the radar intensity exceeds b, may be regarded as a criterion of the detectability of weak echoes. This "detectability" is shown for k = 25, 100, and 400 as a function of the echo/noise ratio. *Subject Headings:* **1. Radar signal intensity 2. Signal intensity measurement 3. Radar noise.**—*Author's abstract.*

6G–251 551.501.81:551.51

Jones, R. F. (*Met. Office, London*), **Turbulence in relation to the radar echoes from cumulonimbus clouds.** *Radar Weather Conference, 3rd, McGill Univ., Montreal, Sept. 15–17, 1952, Proceedings*, pub. **1952.** p. A-37 to A-44. fig., 2 tables, ref. **DWB**—Ground radar observations, made at the same time as accelerometer records were obtained in a Spitfire aircraft traversing cumulonimbus clouds, make it possible to relate the turbulence to the characteristics of the radar echo received from the part of the cloud traversed. It is found that the radar echo characteristics, as shown on a height-range display, can be used to indicate the places in a cloud where turbulence is likely to be the most severe. Edges of the echoing volume in particular are shown to be regions of severe turbulence. Severe gusts frequently occur in sequences with the distance between individual gusts less than 400 yds. Although most of the severe gusts occurred in the echo-producing regions of the clouds there was nevertheless a substantial number of severe gusts experienced in clouds, or parts of a cloud, which failed to give a detectable radar echo. *Subject Headings:* **1. Radar turbulence measurement 2. Radar echo interpretation 3. Airways meteorology.**—*Author's abstract.*

6G–252 551.501.81:551.515.13

Katzin, Martin (*Naval Res. Lab., Wash., D. C.*), **Radar measurements of Philippine rain squalls.** *Radar Weather Conference, 3rd, McGill Univ., Montreal, Sept. 15–17, 1952, Proceedings*, pub. **1952.** p. D-21 to D-28. 3 figs., 2 tables, 3 refs., 6 eqs. **DWB**—Quantitative measurements of radar echoes from rain squalls over the Philippines are described. The measurement technique is discussed and typical results shown for a wavelength of 9.1 cm. The radar measurements are compared with values calculated from HUMPHREYS' (ground level) rain data and GOLDSTEIN's scattering calculations. The comparison shows that the rain concentration aloft is about 3 orders of magnitude greater than that which reaches ground level. *Subject Headings:* **1. Radar echo measurements 2. Radar rain squall echoes 3. Philippine Islands.**—*Author's abstract.*

6G–253 551.501.81:551.501.577.11

Ligda, Myron G. H. (*M.I.T.*), **The horizontal motion of small precipitation areas as observed by radar.** *Radar Weather Conference, 3rd, McGill Univ., Montreal, Sept. 15–17, 1952, Proceedings*,

pub. **1952.** p. D-41 to D-48. 5 figs., 5 refs., eq. **DWB**—Based on the principle that showers move with the velocity of the precipitation source, an explanation is given for the observed velocities of stratiform and cumuliform precipitation echoes and the formation of parallel bands of precipitation. The relationship between echo motion and geostrophic flow is examined and found to be so close near the 700 mb level, that it is suggested that direction and speed of echo velocities be interpreted in terms of pressure changes aloft. Several examples of deviations from rectilinear motion are shown. *Subject Headings:* **1. Radar precipitation echoes 2. Radar precipitation movement studies.**—*Author's abstract.*

6G–254 551.574.1 551.577:551.501.81

Mount Washington Observatory, **Contributions to the theory of the constitution of clouds.** Contract AF 19(122)-399, Quarterly Progress Report, Oct. 23, **1951.** 11+p. 4 figs., 2 tables, 2 refs., 7 eqs. **DWB**—Values of radar reflectivity index (Z), observed (R) and computed (R_z) rain intensity and their percentage deviations, maximum drop diameter (d_{max}) and liquid water content (W) for 63 rain samples collected at Cambridge, Mass. between March and Sept. 1951 are tabulated. The regression equation $Z = 180R^{1.55}$ is developed. The relation between $\frac{R_z - R}{R_z}$; R and d_{max} is discussed and graphically analyzed. A statistical test for homogeneity is made from simultaneous samples, which are found to be practically identical. A theoretical study of changes in drop size distribution due to coalescence is undertaken and found to indicate that "raindrops of diameter 0.1 to 0.2 mm should practically vanish in a distance of fall of 1 km provided that no new small drops are created by some other mechanism." Daily cloud data summaries from Mount Washington Observatory for Oct. 1951 and a monthly cloud data summary for the same period are reproduced. *Subject Headings:* **1. Cloud physics 2. Drop size distribution 3. Liquid water content of clouds 4. Rainfall intensities 5. Radar analysis of rain.**—*G.T.*

6G–255 551.501.81:551.576.1

Plank, Vernon G.; Atlas, David and Paulsen, Wilbur H., **The nature and detectability of clouds and precipitation as determined by 1.25-centimeter radar.** *Journal of Meteorology*, 12(4):358–378, Aug. **1955.** 20 figs., 6 tables, 39 refs., 5 eqs. **DWB**—This survey shows that about 15% of common clouds within one mile range is detectable, and if at greater range than 10,000 ft the clouds comprise either large water drops or ice crystals. Detection frequencies and typical echo characteristics of various cloud types are given. Slightly less than 50% of the 89 periods when echoes were received can classify as echoes from internationally defined clouds. Correlating cloud echoes with visual clouds showed that 47% of the visual clouds were detectable. Characteristic features of stratiform precipitation and conditions for release are discussed. *Subject Headings:* **1. Radar cloud detection 2. Radar echo interpretation 3. Precipitation physics.**—*From author's abstract.*

6G–256 551.501.81:551.576.1

Plank, V. G.; Atlas, David and Paulsen, W. H. (*all, U. S. A. F. Cambridge Res. Center*), **Preliminary survey of cloud and precipitation detection at 1.25 cm.** *Radar Weather Conference, 3rd McGill Univ., Montreal, Sept. 15–17, 1952, Proceedings*, pub. **1952.** p. B-13 to B-20a. 12+figs., 3 tables, ref. **DWB**—A survey is made of the clouds and precipitation detected at a wavelength of 1.25 cm. The frequencies of detection of various cloud types and their typical echo characteristics are presented. It is found that approximately 47% of all clouds are detected, and that temperature plays an important role in detectability. Of the echoes detected 50% occur either without virga or with virga like extensions that are less than 2500 ft long. Also of interest is the detection of non visible clouds. The importance of the ice phase in temperate latitude rainfall is indicated by the occurrence of only one "warm" shower out of 27 cases of rain. The bright band is observed in 24 of the 26 remaining cases. Cirrus streamers falling into stratiform layers with subsequent lowering of the echo base and rain at the ground is apparently indicative of the natural seeding of supercooled clouds. The occurrence of precipitation appears to be favored if the cloud top temperature is in the −10° to −20°C range and the cloud thickness is between 10,000 and 20,000 ft. Coalescence is also indicated as a contributing factor. *Subject Headings:* **1. Radar cloud detection 2. Radar rain observations 3. Bright band echoes.**—*Authors' abstract.*

6G–257 551.509.52:551.515.3:551.501.8

Radar tornado warning. *Science News Letter*, Wash., D. C., 68(2):20, July 9, **1955. DLC**—The Texas radar tornado warning network consisting of 24 stations was officially dedicated at College Station, Texas, June 25, 1955. The modified radar sets (government surplus) have a range of about 200 mi in which tornadoes can be detected and tracked. The network includes Arkansas, Mississippi, Louisiana and Oklahoma. *Subject Headings:* **1. Radar storm detection 2. Texas tornado warning network.**—*W.N.*

6G–258 551.594.7:06

†Radar Weather Conference, 3rd, McGill University, Montreal, Sept. 15–17, 1952. **Proceedings.** Conference Committee J. S. Marshall, K. L. S. Gunn and Walter Hitschfeld. Montreal, Stormy Weather Research Group, Mcdonald Physics Laboratory, McGill Univ., **1952.** each section re-numbered. figs., tables, refs., eqs. **DWB**—These Proceedings contain multilith reproductions of the 35 papers or long summaries discussed in 6 sessions. Session A covered: Precipitation mechanism (8 papers); B, Cloud observations and cloud radar problems (5 papers); C, Radar weather and aviation (5 papers); D, Rain measurements (8 papers); E, Instruments (6 papers); F, Scattering in the atmosphere (6 papers) and G, Fluctuating signals (5 papers). The papers contain a total of 95 refs. The 98 participants are listed alphabetically with agency represented. It is expected that the major part of the papers discussed will be published in various scientific publications later. *Subject Headings:* **1. Radar meteorology 2. Conferences.**—*W.N.*

6G–259 551.501.81:35

Rex, Daniel F. (*U. S. Navy*), **An operational use of weather radar.** *Radar Weather Conference, 3rd, McGill Univ., Montreal, Sept. 15–17, 1952, Proceedings*, pub. **1952.** p. C-17 to C-20b. 4 figs., 2 refs. **DWB**—The effect of weather on aircraft carrier operations in Japanese waters is briefly discussed. A radar technique for locating "favorable" areas for air operations under certain adverse weather conditions is discussed. The need for additional research in the synoptic interpretation of "echo pattern" changes is emphasized. *Subject Headings:* **1. Military meteorology 2. Radar storm detection 3. Radar echo interpretation 4. Japan.**—*Author's abstract.*

6G–260 551.501.81:551.577.2

Stout, G. E. and Neill, J. C. (*both, Ill. State Water Survey, Urbana*), **Rainfall measurements by radar.** *Radar Weather Conference, 3rd, McGill Univ., Montreal, Sept. 15–17, 1952, Proceedings*, pub. **1952.** p. D-5 to D-12. 3+figs., table, 3 refs. **DWB**—Areal rainfall distribution over a 50 sq mi area was observed by 3 cm radar and by a raingage network of 33 raingages. Isohyetal maps were prepared from both raingage and radar observations in order to compare the rainfall distribution as observed by the two rainfall observation techniques. Average depth of rainfall was computed from radar observations. The computed rainfall values were as accurate as those obtained by a raingage network of one gage per 200 sq mi. *Subject Headings:* **1. Radar areal rainfall measurement 2. Rain gage networks.**—*Authors' abstract.*

6G–261 551.501.81:551.576

Swingle, Donald M. (*U. S. Signal Corps. Engr. Labs.*), **An operational comparison of radar cloud detection at 1.25 cm and 0.86 cm.** *Radar Weather Conference, 3rd, McGill Univ., Montreal, Sept. 15–17, 1952, Proceedings*, pub. **1952.** p. B-21 to B-28. 3 figs., 3 tables, eqs. **DWB**—Simultaneous radar cloud observations made over the five month period Nov. 1951–March 1952 on radar operating at 1.25 cm and 0.86 cm wavelength showed that theoretical expectations, based on the Rayleigh scattering theory, were generally fulfilled. No significant variation was found between the two equipments in the measured height of cloud bases. The period included no cases during which cumulonimbi were observed. The 1.25 cm equipment missed approximately half the cumulus, cirrostratus and cirrus clouds observed by the 0.86 cm equipment, but showed more nearly equal performance on other cloud types. A study of the differences in observed top height (0.86–1.25) showed that, in general, larger discrepancies were found in the higher cloud types but negative values also occurred. A qualitative discussion of the growth of echo intensity with height near the cloud tops is given. *Subject Headings:* **1. Radar cloud observation 2. Radar signal intensity 3. Radar performance.**—*Author's abstract.*

6G–262 551.509.52:551.515.3:551.501.81

Texas radar tornado warning network. *American Meteorological Society, Bulletin*, 36(5):234, May **1955. DWB**—A brief account of the history and a description of the Texas Radar Tornado Warning Network which was dedicated at Texas A. & M. College, June 24–25, 1955. *Subject Headings:* **1. Radar tornado warning networks 2. Texas tornado warning network.**—*I.L.D.*

6G–263 551.501.81:551.515:629.13

Tolefson, H. B., **Some possible reductions in gust loads through use of radar in transport airplanes.** *Radar Weather Conference, 3rd, McGill Univ., Montreal, Sept. 15–17, 1952, Proceedings*, pub. **1952.** p. C-9 to C-16. 4 figs., 5 refs. **DWB**—Turbulence measurements taken in different weather conditions are analyzed to obtain an estimate of the possible reductions in gust loads and increases in passenger comfort that might be realized by airlines through use of radar for detecting and avoiding storm areas. The results indicate that a 10% reduction might be obtained in the magnitude of the largest gust loads which are pertinent to the ultimate strength requirements of airplane structures. It appears, however, that little, if any, reduction would be realized in the

small and more numerous gusts which are important to the fatigue life of the structure. On the question of passenger comfort, the number of uncomfortable flights experienced on the airlines would probably be reduced by a considerable amount when radar is used in transports. Evidence obtained to date on contour radar indicates that the contour attachment would be desirable for selecting the smoothest flight path through the storms that could not be avoided. *Subject Headings:* **1. Airways meteorology 2. Turbulence 3. Radar storm detection 4. Contour radars.**—*Author's abstract.*

6G–264 551.509.52:551.515.2

U. S. Bureau of Aeronautics (Navy), **Improved hurricane and typhoon forecasting techniques.** Project AROWA (TED-UNL-MA-501.12), Contract N189s-87508, First Progress Report, July 1–Dec. 31, 1952. 8 p. **DWB**—General account of activity and intentions comprising a literature review concerning forecasting, development of radar balloons and radar photographs. No results or data presented in this first report. (*Same item as* 6.1–97, Jan. 1955, *MAB.*) *Subject Headings:* **1. Hurricane forecasting 2. Typhoon forecasting 3. Radar balloons 4. Radar photographs. I. General Mills, Inc.**—*A.A.*

6G–265 551.501.81:551.577-551.509.31:551.557

U. S. Bureau of Aeronautics (Navy), **Utilization of radar in short-range weather forecasting.** Project AROWA (TED-UNL-MA-501.18), First-Third Quarterly Progress Reports, July 1, 1952–April 1, 1953. 3 pieces (each about 15 p.), figs., tables, refs. **DWB**—In the first Report, as a beginning on a project to study radar as a weather forecasting aid and to develop new forecasting techniques using radar (including prediction of rainfall intensity, the relation between visibility and rainfall intensity, squall winds, etc.), a literature search (of MAB) has been conducted, revealing no quantitative literature on relation between visibility and rainfall intensities. (*Same item as* 5.3–90, March 1954, *MAB.*) The second Report deals with sixty-nine cases of radar echo movements correlated imperfectly with mean wind for three layers: 2–20,000 ft, 2–26,000 ft and 6–30,000 ft and charts for 6,000, 10,000 and 20,000 ft level. Study of visibility reduction due to shower-type precipitation initiated using weather observations from eight Illinois stations. (*Same item as* 4E–270, May 1953, *MAB.*) The third Report includes a graph for determining shower intensity and visibility reduction from radar echoes and tables showing tests of ATLAS' equation. *Subject Headings:* **1. Radar rainfall intensity studies 2. Radar echo-wind aloft correlations 3. Atlas' radar rain intensity equation 4. Goose Creek, Illinois. I. Illinois State Water Survey II. Contract N189s-88164.**—*M.R.*

6G–266 551.577:551.501.81

Wexler, Raymond, **Radar analysis of precipitation streamer observed 25 February 1954.** *Journal of Meteorology*, 12(4):391–393, Aug. **1955.** 5 figs., 2 refs. **DLC**—A radar study of the streamers of February 25, 1954 at Cambridge, Mass., indicates that horizontal bands of rain are produced by the action of wind shear on the precipitation particles. It is suggested that a "generating layer," responsible for the streamer formation, consists of a cumuliform cloud configuration within which ice crystals grow rapidly both by sublimation and by riming. *Subject Headings:* **1. Radar analysis of precipitation 2. Rain structure.**—*Author's abstract.*

6G–267 551.501.81:551.515.4

Wexler, Raymond (*M.I.T.*), **Radar echoes from a growing thunderstorm.** *Radar Weather Conference, 3rd, McGill Univ., Montreal, Sept. 15–17, 1952, Proceedings*, pub. **1952.** p. A-1 to A-8. 3 figs., table, 11 refs., eqs. **DWB**—The theoretical growth of hail in a cumulus cloud is computed and the behavior of the first radar echo is analyzed. Good agreement is found between the theory and the observations made by WORKMAN and REYNOLDS. The relation between hail growth and thunderstorm electricity is considered. *Subject Headings:* **1. Radar echoes from thunderstorms 2. Hail growth.**—*Author's abstract.*

PART III. METEOROLOGICAL ARTICLES APPEARING IN RECENTLY ISSUED PUBLICATIONS

Note: The contents of periodicals included in this section are for information only and will not be listed in the monthly indexes until abstracted. When material is furnished in advance of date of publication, the pagination may be omitted.

Akademiia Nauk SSSR, Izvestiia, Seriia Geofizicheskaia, No. 1, Jan./Feb. 1955.

Feigel'son, E. M.: **O pogloshchatel'nykh svoĭstvakh vodianogo para i uglekislogo gaza v atmosfere,** [Absorptive properties of water vapor and carbon dioxide in the atmosphere], p. 69–79.

Obukhov, A. M.: **S'ezd meteorologov v Budapeshte,** [Meeting of meteorologists in Budapest], p. 86.

No. 2, March/April, 1955.

Iampol'skiĭ, A. D.: **O zavisimosti parametrov raspredeleniia elementov voln ot razgona, skorosti vetra i prodolzhitel'nosti ego deĭstviia,** [Dependence of parameters of distribution of elements in waves on momentum, wind velocity and length of time of its action], p. 156–165.

Malkevich, M. S.: **O vertikal'nom raspredelenii temperatury v atmosphere,** [Vertical distribution of temperature in the atmosphere], p. 166–177.

Iaroslavtsev, I. N.: **Nabliudeniia infrakrasnoĭ radiatsii vo vremia solnechnogo zatmeniia 30 iiunia 1954 g. v Tashkente,** [Observations of infrared radiation during the solar eclipse of June 30, 1954 in Tashkent], p. 185–186.

American Geophysical Union, Transactions, Vol. 36, No. 3, June 1955.

Laevastu, Taivo and Millis, Otto: **Extraterrestrial material in deep-sea deposits,** p. 385–389.

Elvey, C. T.; Leinbach, Harold; Hessler, Joan and Noxon, John: **Preliminary studies of the distribution of auroras in Alaska,** p. 390–395.

Rounds, Wellington, Jr.: **Solutions of the two-dimensional diffusion equations,** p. 395–405.

Lincoln, John H.; Paquette, Robert G. and Rattray, Maurice, Jr.: **Microsalinometer for oceanographic model studies,** p. 406–412.

Smith, Paul Ferris; Richard, Joseph D. and Stephens, Frank H.: **A technique for the spectral analysis of sound in the ocean,** p. 413–418.

van't Woudt, Bessel D.: **On a hillside moisture gradient in volcanic ash soil, New Zealand,** p. 419–424.

Veihmeyer, F. J. and Hendrickson, A. H.: **Does transpiration decrease as the soil moisture decreases?,** p. 425–428.

Colman, E. A. et al: **Discussion** *[on preceding article]*, p. 429–448.

Slack, H. A. and Krumbein, W. C.: **Radioactivity in rocks,** p. 460–464.

Schriever, William: **Were the Carolina Bays oriented by gyroscopic action?,** p. 465–469.

Culberston, Margaret F.: **An oceanographic slide rule for computing temperature, depth and salinity,** p. 473–480.

Chow, Ven Te: **On the determination of frequency factor in log-probability plotting,** p. 481–486.

Boggs, James R.: **Calculating the distance between equivalent poles of a bar magnet,** p. 487–488.

Report of the Committee on the Physics of Soil Moisture, 1952–1953, p. 489.

Oliveira, J. Tiago de: **Corrections to a solution concerning hydrologic frequency analysis,** p. 489–490.

Silvester, Richard: **Discussion of "Wave run-up on sloping structures" by K. N. Granthem,** p. 493.

Kurtyka, John C.: **Discussion of "Precipitation measurements on wind-swept slopes" by Austin E. Helmers,** p. 493–494.

Marble, John Putnam: *Review of* **Hans Petterson: The ocean floor,** p. 498.

Sieveka, E. H.: *Review of* **Cecil B. Ellis: Fresh water from the ocean,** p. 498.

Schmidt, Erwin: *Review of* **Pierre Tardi and Georges Laclavere: Traité de géodésie, Volume 1. Book 2, Calcul de la triangulation,** p. 499.

Davis, William Morris—Geographical essays, p. 500.

Bibliography, p. 534–545.

American Meteorological Society, Bulletin, Vol. 36, No. 6, June 1955.

Knox, J. L.: **The storm "Hazel,"** p. 239.
Fletcher, Robert D.: **Computation of maximum surface winds in hurricanes,** p. 247.
Sanders, Frederick and Kessler, Edwin, III: **A test of the application of vorticity charts,** p. 251.
Parmelee, George V.: **Applications of meteorological data to indoor climate in buildings,** p. 256.
Brier, Glenn W.: **Seven-day periodicities in certain meteorological parameters during the period 1899–1951,** p. 265
Penn, Samuel: **A possible high-level thunderstorm mechanism in the case of August 20, 1951 over New England,** p. 278.
Radar operation and data collection desired during tornadoes and other severe weather conditions, p. 289.
Program of the 139th National Meeting of the American Meteorological Society, and Fifth Weather Radar Conference sponsored by the U. S. Army Signal Corps, Signal Corps Engineering Laboratories, Fort Monmouth, New Jersey, September 12–15, 1955, at Asbury Park, New Jersey, p. 299.

Annali de Geofisica, Rome, Vol. 7, No. 4, Oct. 1954.

Caloi, Pietro: **L'astenosfera come canale-guida dell'energia sismica,** [The asthenosphere as conductor of seismic energy], p. 491–501.
Dominici, Piero: **Andamento della ionosfera a Roma nel periodo 1948–1953,** [Condition of the ionosphere at Rome, 1948–1953], p. 503–520.

Vol. 28, No. 1, Jan. 1955.

Mariani, F.: **La teoria della fotoionizzazione di Chapman in atmosfera non isoterma,** [Chapman theory of photoionization in non isothermal atmosphere], p. 59–73.
Gandolfo, Salvatore: **Utilizzazione, per la registrazione fotografica del potenziale del campo elettrico atmosferico, di un elettrometro Benndorf, in origine a registrazione meccanica,** [Utilization of a Benndorf electrometer, originally a mechanical recorder, for the photographic recording of the potential of the atmospheric electrical field], p. 75–82.
Dominici, P. and Mariani, F.: **Considerazioni critiche sulla regione *F* della ionosfera,** [Comments on the *F* region of the ionosphere], p. 103–120.
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Kulsrud, Russell M.: **Effect of magnetic fields on generation of noise by isotropic turbulence,** p. 461–480.
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Marine Observers' log—July, August, September, p. 146.
National Institute of Oceanography, p. 156
Netherlands Conference on Meteorological Problems of the North Sea, p. 159.
Brown, P. R.: **Wave heights and periods at ocean weather stations India and Juliett,** p. 163.
Aurora, p. 167.
Ships' weather reports in Mediterranean and Red Seas, p. 168.
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Lumb, F. E.: **An explanation of the behaviour of the depression of October 4–6, 1952, in terms of thermal-development theory,** p. 211–213.
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Clements, J. A.: **Distortion of condensation trails,** p. 223–224.
Blowers, K. E.: **Ice needles at Ipswich,** p. 224–225
Bannon, J. K.: **Aircraft icing at very low temperature,** p. 225.
Jones, R. F.: **Abnormal radio propagation, December 3, 1954,** p. 225–226.
Ground fog at Stevenage, Hertfordshire, p. 226.
Awards to civil airplane personnel, p. 226.
The R.R.S. *Discovery II* on temporary duty as an ocean weather ship, p. 227.
Meteorological Office Staff Centenary Dinner, p. 228.
Robinson, G. D.: **Review of K. E. Bullen: Seismology,** p. 229.

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Hinkel, C. H. and Saunders, W. E.: **Speed of movement of warm fronts on the Atlantic,** p. 241.
Lawrence, E. N.: **Effects of a wind-break on the speed and direction of wind,** p. 244.
Bruce, W. J.: **Example of a double warm frontal structure over north-west Europe,** p. 251.
Smith, R. Michael: **Glazed frost,** p. 259.
Boyden, C. J.: [Review of] F. H. Ludlam and R. S. Scorer: **Further outlook,** p. 259.
Hogg, W. H.: [Review of] S. A. Searle: **Plant climate and irrigation,** p. 261.
Weather of June 1955, p. 263.
Rainfall of June 1955, p. 264.

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Lopukhin, E. A.: **K voprosu metodiki aktinometricheskikh nabliudeniĭ i ikh obrabotki,** [Methodology of actinometric observations and their treatment], p. 47–48.

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Bolin, Bert: **Numerical forecasting with the barotropic model,** p. 27–49.
Alfvén, H.: **On the electric field theory of magnetic storms and aurorae,** p. 50–64.
Block, L.: **Model experiments on aurorae and magnetic storms,** p. 65–86.
Schumacher, Nils Jørgen: **Upper air temperatures over an Antarctic station: preliminary note,** p. 87–95.
Kleinschmidt, E.: **Die Entstehung einer Höhenzyklone über Nordamerika,** [Origin of a high level cyclone over North America], p. 96–110.
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Rossby, C. G., and Egnér, H.: **On the chemical climate and its variation with the atmospheric circulation pattern,** p. 118–133.
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Ogawa, Masaru: **Band spectrum of nitric oxide in the near infrared region,** p. 39–46.
Ogawa, Masaru: **On the origin of sodium D-lines in the nightglow and twilight flash,** p. 47–61.
Mori, Kazuo: **Absorption spectrum of nitrogen dioxide in the vacuum ultraviolet,** p. 62–69

UNESCO Symposium on Typhoons, Tokyo, Nov. 9–12, 1954, Proceedings. pub. 1955.

Prevention of disaster caused by typhoons

Fogg, J. K. and Wang, Griffith: **Effects of typhoons at Taipei and Tainan, Formosa, p. 1–9.**
Heywood, G. S. P.: **Pressure of typhoon winds on structures,** p. 11–15.
Aki, Koichi: **Some problems on flood control in Japan,** p. 17–21.
Takahashi, K.: **On the relationship between typhoon energy and damage amount,** p. 23–30.
Wadati, K. and Hirono, T.: **Storm tides caused by typhoons,** p. 31–48.

Structure of typhoons

Heywood, G. S. P.: **Some notes on the structure of Hong Kong Typhoons,** p. 49–52.
Arakawa, H.: **On the pyramidal, mountainous and confused sea in the right or dangerous semicircle of typhoons,** p. 53–54.
Namekawa, T. and Aoki, S.: **On the structure of the disastrous typhoon hitting the Japanese Islands (A summary note on Namekawa's theory of main and secondary typhoons),** p. 55–59.

Aoki, Shiichi: **On the structure of disastrous typhoons hitting the Japanese Islands (A summary note of the theory of main and secondary typhoons)**, p. 61–77.
Depperman, C. E.: **Tropical meteorological factors with special reference to typhoons**, p. 79–83.
Takeuchi, M.: **On the behaviour and regeneration of tropical cyclones in the middle latitudes**, p. 85–98.
Huang, Hsia-Chien: **Typhoon structure seen from upper air data**, p. 99–108.
Sherman, Leon: **Reconnaissance of the "complete" hurricane**, p. 109–119.
Hatakeyama, H.; Imai, I. and Masuda, y.: **On radar observations of typhoon "Lorna,"** p. 121–128.
Simpson, R. H.: **On the structure of tropical cyclones as studied by aircraft reconnaissance**, p. 129–150.

Formation and development of typhoons

Sasaki, Y.: **Recent studies on the formation and development of tropical cyclones in Japan**, p. 151–161.
Takeuchi, M.: **Note on the theory of formation of tropical cyclones**, p. 163.
Wang, Griffith: **Development and movement of typhoons**, p. 165–174.
Desai, B. N. and Rao, Y. P.: **Some aspects of depressions and cyclones in the Indian Seas**, p. 175–198.
Terada, K.: **Development of typhoon from the viewpoint of energy supply from ocean**, p. 199–206.
Haque, S. M. A.: **Relationship between size and growth-rate of incipient convective disturbanesc**, p. 207–211.
Namias, Jerome: **Long range factors affecting the genesis and paths of tropical cyclones**, p. 213–219.

Movement of typhoons

Sasaki, Y. and Miyakoda, K.: **Prediction of typhoon tracks on the basis of numerical weather forecasting method**, p. 221–233.
Kume, T.: **Idealized fundamental model of the typhoon trajectories and the latitude of recurving**, p. 235–241.
Ramanathan, K. R.: **On upper tropospheric easterlies and the travel of monsoons and post-monsoon storms and depressions**, p. 243–244.
Sherman, Leon: **Proposal for the use of SOFAR signals for the reporting of hurricane positions**, p. 245–246.
Riehl, H. and Haggard, W. H.: **Quantitative method for the prediction of tropical storm motion**, p. 247–248.
Po E, Maung: **Storms and depressions over Burma which have their origin in the typhoons of the Pacific Ocean and South China Sea during 1949–1953**, p. 249–256.
Sugii, A.: **On the path of typhoon**, p. 257.

Weather, London, Vol. 10, No. 4, April 1955.

Meetham, A. R.: **Know your fog**, p. 103–105.
Scorer, R. S.: **Plumes from tall chimneys**, p. 106–109.
Turner, W. C.: **Atmospheric pollution**, p. 110–119.
Bonacina, L. C. W.: **Summer visibility across London from Hampstead**, p. 120–125.
S——, P. A.: **Smoke plumes and how to control them**, p. 126
R——, R. S.: **The weather of March 1955: mainly cold and sunny; dry most areas; frequent snow showers in East**, p. 127–128.
Long, I. F.: **Dew and guttation**, p. 128.

Vol. 10, No. 5, May 1955

Mason, B. J.: **Atomic explosions and the weather**, p. 139–141.
Abbott, S. G.: **The thunderstorms and tornadoes of 8 December 1954**, p. 142–146.
Arakawa, H.: **A typhoon over Japan**, p. 146.
Morrison, R. B.: **Atmospherics and meteorological research**, p. 147–151.
Lawrence, E. N.: **The microclimatology of caves**, p. 152–155.
R——, R.S.: **The weather of April 1955: mainly dry and sunny**, p. 163.

Vol. 10, No. 6, June 1955.

Veryard, R. G.: **History and constitution of the Meteorological Office**, p. 178–182.
Whiten, A. J.: **Bunions and seaweed**, p. 183–190.
Sutton, Graham: **High-speed computing and the operational meteorologist**, p. 190–193.

Hay, R. F. M.: **William Dampier's contribution to meteorology,** p. 194–199.
Long, Ian F.: **Frozen dew,** p. 199–200.
Boughner, C. C.: **Hurricane Hazel,** p. 200–205.
D——, F. E.: **Symposium on Atmospheric Condensation Nuclei,** p. 207.
R——, S. R.: **The weather of May 1955: changeable; cool; heavy rain in the South,** p. 208–209.

Yugoslavia. Hidrometeorološka Služba, Vesnik, Vol. 3, No. 3/4, July/Dec. 1954.

Radošević, M. D.: **Prof. Milan Kovačević,** [Obituary note], p. 71–72.
Bidovec, F.: **Poboljšajma vodomernu službu,** [The hydrologic service should be improved, pt. 2], p. 73–80.
Makjanić, Berislav: **Kako računati dnevni srednjak temperature zraka?** [How to compute daily mean temperature, Pt. 2], p. 80–85.
Makjanić, Berislav: **I. Sastanak Meteorologa-Klimatologa Hidrometeorološke Službe FNRJ,** [First meeting of meteorologists and climatologists of the Yugoslav Hydrometeorological Service], p. 85–88.
Kirigin, Božidar: **Treće medunarodno zasjedanje za Alpsku Meteorologiju, Davos 12–14, IV. 1954,** [Third International Conference on Alpine Meteorology, April 12–14, 1954, Davos], p. 88–90.
Dobrilović, Borivoje N.: **Primer primene zakona normalne raspodele na jedan klimatološki niz,** [Example of an application of the law of normal distribution to a climatological series], p. 90–98.
Durić, Dušan: **Razvoj vremena pri prolazu hladnog fronta preko Vojvodine 3 i 4 aprila 1951,** [Weather development during a cold-front passage through Voivodina on April 3/4, 1951], p. 99–103.
Manohin, V.: **Neka zapažanja u vezi sa razvojem vremena na Kredarici, 2515 m,** [Some observations on weather development at Kredarica, 2515 m], p. 103–105.
Manohin, V.: **Topljenje snežnog pokrivača na planinama prema podacima sa Kredarice,** [Melting of the snow cover in mountains, according to data for Kredarica Mountain], p. 105–106.
Malovčak, P.: **Ponovno veliki broj grmljavina v Osijeku,** [Considerable thunderstorm activity again in Osijek], p. 106–110.
Vujičić, K.: **Vanredne vremenske pojave u FNRJ, April–Sept. 1954,** [Outstanding weather phenomena in Yugoslavia, April–Sept. 1954], p. 111–115.
Vujičić, K.: **Prenos slika pomoću metode faksimil,** [Transmission of pictures by means of the facsimile technique], p. 117.
Vujičić, K.: **Maloja vetar,** [Maloja wind], p. 117–118.
[Čadež, Marjan]: **Toplotna provodljivost vazduha,** [Heat conductivity of the air], p. 118–119.
Vesti iz službe i obaveštenja, [News and notices from the Service], p. 120–133.
Makjanić, B.: **Aerološka opažanja bure i juga u Šibeniku na dalmatinskoj obali,** [Review of K. W. Grober: Aerologische Beobachtungen über Bora und Scirocco in Sibenik an der dalmatinischen Küste], p. 135–136.
Spisak objavljenih radova pok. prof. Milana Kovačevića, [List of published works of the late Professor Milan Kovačević], p. 137–138.

Zeitschrift für Meteorologie, Berlin, Vol. 9, No. 1, Jan. 1955.

Heckert, L.: **Klimaänderungen und Singularitäten,** [Climatic changes and singularities], p. 1–14.
Band, G.: **Ist der Main eine Wetterscheide?** [Is the Main a weather divide?], p. 14–21.
Teichert, F.: **Vergleichende Messung des Ozongehaltes der Luft am Erdboden und in 80 m Höhe,** [Comparative measurement of ozone content of the air at ground level and at a height of 80 m], p. 21–27.
Die Witterung in der Deutschen Demokratischen Republik. November 1954, [Weather in the German Democratic Republic, Nov. 1954], p. 28–29.
Erdmagnetische Kennziffern für die Zeit vom 13. Juni bis 1. September 1954, [Geomagnetic indices for the period from June 13 till Sept. 1, 1954], p. 30.
Provisorische Züricher Sonnenflecken-Relativzahlen für das vierte Vierteljahr 1954, [Provisional Zurich sunspot-relative numbers for 4th quarter of 1954], p. 31.

Vol. 9, No. 2, Feb. 1955.

Maede, H.: **Die aerologischen Verhältnisse über Tiefkernen bei mitteleuropäischen Trog- und Zentraltiefiagen,** [Aerological conditions above deep cores during Central European trough and depression situations], p. 33–46.
Möller, F.: **Strahlungsvorgänge in Bodennähe,** [Radiation processes near the ground], p. 47–53.

Die Witterung in der Deutschen Demokratische Republik, Dezember 1954, [Weather in the German Democratic Republic, Dec. 1954], p. 54–55.

Erdmagnetische Kennziffern für die Zeit von 6. August bis 25. Oktober 1954, [Geomagnetic indices for the period Aug. 6–Oct. 25, 1954], p. 56.

Entwurf zu einem Normblatt: Formelzeichen der Meteorologie und Geophysik, [Plan for a standard form: Formula symbols of meteorology and geophysics], p. 57–58.

Weigel, Werner: **Luftspiegelungen auf dem Brocken,** [Mirages on the Brocken], p. 58.

Beobachtung eines Mondregenbogens in Salzwedel, [Observations of a lunar rainbow at Salzwedel], p. 58.

Czepa, Otto: **Die Tätigkeit der Ungarischen Forschungsanstalt für Wasserwirtschaft,** [Activity of the Hungarian Research Institute for Hydrology], p. 58.

Böhme, W.: *Review of* **M. I. Rusin—Nekotorye resultaty teoreticheskogo analiza chetyrekh sukhoveiev. Einige Resultate einer theoretische Analyse von vier Suchoweitagen,** [Results of a theoretical analysis of four instances of sukhovei (dry winds)], p. 59.

Haake, Dr.: **Koninklijk Nederlands Meteorologisch Instituut 1854–1954,** [Royal Netherlands Meteorological Institute, 1854–1954], p. 60.

Heyer, E.: *Review of* **H. Reuter—Methoden und Probleme der Wettervorhersage,** [Methods and problems of weather forecasting], p. 60.

Vol. 9, No. 3, March 1955.

Matzke, H. and Vilkner, H.: **Der Einfluss von Land- und Seewind auf die Abkühlungsgrösse,** [Influence of land and sea breezes on cooling power], p. 65–77.

Teich, M.: **Bemerkungen zu einigen Volkswetterregeln für den Hochwinter,** [Remarks on some popular weather maxims dealing with midwinter], p. 77–84.

Heyer, E.: **Die wetterlagenmässige Betrachtung strenger Winter,** [A consideration of severe winters from the point of view of weather situations], p. 85–88.

Die Witterung in der Deutschen Demokratischen Republik. Januar 1955, [Weather in the German Democratic Republic, Jan. 1955], p. 91–93

Sandner, W.: **Häufigkeit und Formen zusammengesetzter Halo-Erscheinungen,** [Frequency and form of compound halo phenomena], p. 88–91.

Endgültige Sonnenfleckenrelativzahlen für 1954, [Final relative sunspot numbers for 1954], p. 93.

Eine Nebelsonnenbeobachtung an der Meteorologischen Station Plauen/Vgtl, [A parhelia observations in the meteorological station Plauen/Vgtl], p. 94.

Vol. 9, No. 4, April 1955.

Müller-Annen, Hans: **Statistische Untersuchungen zur Frage der Realität der Singularitäten,** [Statistical investigations on the reality of singularities], p. 97–110.

Maede, H.: **Über zeitliche und örtliche Beziehungen zwischen den Komponenten der Zonal- und Meriodionalzirkulation in 500 mb über Mitteleuropa und den angrenzenden Gebieten,** [Temporal and spatial relationships between the components of the zonal and meridional circulation at 500 mb over Europe and neighboring regions], p. 111–115.

Reiter, Reinhold: **Ergebnisse synchroner Registrierungen luftelektrischer Elemente in sechs Niveaus zwischen 700 and 3000 m Seehöhe,** [Results of synchronous registrations of atmospheric electrical elements at six levels between 700 and 3000 m], p. 116–120.

Geselle, P. and Matzke, H.: **Ein weiteres Gerät zur Registrierung der Abkühlungsgrösse,** [Another device for registering cooling power], p. 120–123.

Hering, W.: **Vergleich der Radiosonden- Aufstiege in Lindenberg, Berlin-Wuhlheide und Berlin-Tempelhof vom 19.9.1954,** [Comparison of radiosonde ascents at Lindenberg, Berlin (Wuhlheide) and Berlin (Tempelhof) on Sept. 19, 1954], p. 123–125.

PART IV. AUTHOR AND SUBJECT INDEX

In this section will be found references to the number given at the head of each abstract or entry. In Part I each entry begins with the number 6.7–, and in the bibliography on Radar Cloud Physics (Part II) each entry begins with the number and letter 6G–. This index is divided into three parts:

Index of Authors Index of Subjects Index of Geographical Locations

INDEX OF AUTHORS

Ångström, A., 6.7–268
Adachi, Jiro, 6.7–233
Aden, Arthur L., 6G–102
Advances in Geophysics, 6.7–1
Air Facts, 6G–151
Air-Sea Safety, 6G–10
Alisov, Boris Pavlovich, 6.7–9
Altman, H. G., 6G–202
American Airlines System, 6G–17
American Meteorological Society, 6G–229, 6G–262
Andersen, K. F., 6.7–229
Anderson, A. D., 6.7–124
Aniol, R., 6.7–67
Annales de Géophysique, 6.7–41
Argonne National Laboratory, 6.7–302
Arzhanov, A. S., 6.7–8
Asakawa, Tomio, 6.7–300
Ashburn, Edward V., 6.7–344
Ashmore, S. E., 6.7–256
Atlas, David, 6G–31, 6G–33, 6G–60, 6G–104, 6G–105, 6G–106, 6G–117, 6G–169, 6G–170, 6G–207, 6G–230, 6G–231, 6G–234, 6G–255, 6G–256
aufm Kampe, H. J., 6G–232
Aulitsky, H., 6.7–316
Austin, Pauline, 6G–32, 6G–61, 6G–62, 6G–107, 6G–167, 6G–233

Balls, W. Lawrence, 6.7–215
Banks, Harold C., 6G–31
Barabashev, N. P., 6.7–77
Barlow, E. W., 6G–108
Barratt, P., 6G–109
Bartels, Julius, 6.7–26
Bartnoff, Shepard, 6G–33, 6G–104, 6G–234
Battan, Louis J., 6G–110, 6G–235, 6G–240
Bauer, Albert, 6.7–24
Baur, Franz, 6.7–321
Beaumont, Robert T., 6.7–280
Beaver, Sir Hugh, 6.7–160
Bedford, T., 6.7–327
Beebe, Robert G., 6.7–186
Beliakov, M. F., 6.7–216, 6G–111
Bellany, John C., 6.7–91
Bemis, Allan C., 6G–34, 6G–63, 6G–171, 6G–218
Benesch, W., 6.7–154
Benioff, Hugo, 6.7–1
Bensin, Basil M., 6.7–152, 6.7–317
Berkner, L. V., 6.7–21
Bidault, G., 6.7–303
Bigg, W. H., 6.7–257
Biggs, John M., 6.7–233
Bigler, S. G., 6G–185
Bilyk, V. IA., 6.7–8
Binckley, E. T., 6G–15
Blackmer, Roy H., Jr., 6G–172
Blackwell, M. J., 6.7–198
Blanchard, Duncan C., 6G–112, 6G–236
Blewett, Stephen E., 6.7–159
Blum, H. F., 6.7–196
Bodolai, István, 6.7–58
Böer, Wolfgang, 6.7–226
Boggress, W. R., 6.7–208
Bordan, J., 6G–125, 6G–126
Bose, N. K., 6.7–295
Boucher, Roland J., 6G–64, 6G–100, 6G–237
Bowen, E. G., 6G–35, 6G–36, 6G–37, 6G–164
Bozzoli, G., 6G–27
Braham, Roscoe, 6G–38, 6G–94, 6G–240
Brier, Glenn W., 6.7–309
British Standards Institution, 6.7–105
Broc, J., 6G–39, 6G–96, 6G–97, 6G–113
Brogan, Lee, 6.7–345
Bronwell, G. L., 6.7–70
Brooks, C. E. P., 6.7–310
Brown, J. R., 6.7–327
Browne, Ian C., 6G–65, 6G–66, 6G–109, 6G–114, 6G–173, 6G–238
Browne, L. C., 6.7–263
Brunk, Ivan W., 6.7–276
Buchinskii, I. E., 6.7–272
Budyko, M. I., 6.7–247, 6.7–315
Bullig, H. J., 6.7–83
Bunting, Donald C., 6G–40
Burgos, Juan J., 6.7–102
Busbridge, I. W., 6.7–12
Bush, George Leonard, 6.7–7
Buswell, A. M., 6G–174
Byers, Horace R., 6G–239, 6G–240

California. University at Los Angeles. Department of Meteorology, 6.7–246, 6.7–251
California. University. Institute of Geophysics, 6.7–14, 6.7–243
Campbell, F. W., 6G–156

LIST OF PERIODICALS

Note: This list contains the titles of the periodicals which regularly contain material on meteorology or related fields and it comprises only a small percentage of the periodicals from which pertinent articles are abstracted. The preferred form of title entry is given in bold face type.

PERIODICALS IN WHICH METEOROLOGICAL ARTICLES REGULARLY APPEAR

Académie des Sciences, Paris, Comptes Rendus.
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★**WMO Bulletin,** World Meteorological Organization, [Geneva].
★**Zeitschrift für Meteorologie,** Meteorologisches Observatorium, Potsdam.

★ Indicates those periodicals which are primarily meteorological.

TABLE OF CONTENTS

Meteorological Abstracts and Bibliography, Volume 6, Number 7, July 1955

Foreword iii

Explanations iv

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL MATERIAL

Major General Works 923
Collected Works 923
Textbooks and Popular Science Books 925
Review Articles and Monographs 927
General Geophysics and Meteorology 929
General Geophysics 929
Expeditions 932
Networks—Observatories 934
Congresses, Conventions, etc. 936
Bibliographies, Indexes, Glossaries 938
Education and History 939
Education 939
History 940
Biography 940
Applied Meteorology 941
Marine Meteorology and Oceanography 941
Aviation Meteorology 943
Industrial and Engineering Meteorology 944
Agricultural Meteorology 945
Meteorological Observations and Instruments 946
Methods of Observation 946
Observational Data 948
Instrument Carriers 949
Instruments 950
Synoptic Analysis and Forecasting 952
Structure and Physics of the Atmosphere 956
Composition of the Atmosphere 956
Atmospheric Pollution 957
Upper Atmosphere—Ionosphere 958
Mechanics and Thermodynamics of the Atmosphere 958
General Circulation 959
Atmospheric Disturbances 961
Radiation and Temperature 964
Radiation 964
Temperature 967
Soil Temperature 969
Water Temperature 970
Pressure and Wind 970
Pressure 970
Turbulence 971
Wind 972
Wind Effects 973
Upper Air Winds 975
Vertical Winds 976
Aqueous Vapor and Hydrometeors 976
Evaporation 976
Condensation 977
Fog 978
Clouds 979
Precipitation 980
Rain 982
Snow 983
Hydrometeorology 984
Climatology and Bioclimatology 986
Climatology 986
Climate of Particular Places 986
Climatic Changes 988
Microclimatology 990
Climatic Classification 991
Bioclimatology 991
Environmental Influences 993
Miscellaneous 993
Solar Influences 993
Optical Phenomena 994
Electrical Phenomena 944
Auroras 995
Acoustical Phenomena 996

PART II. ANNOTATED BIBLIOGRAPHY ON RADAR CLOUD PHYSICS

Introduction 997
Outline of Contents 997
Supplementary Material 1041

PART III. METEOROLOGICAL ARTICLES APPEARING IN RECENTLY ISSUED PUBLICATIONS 1051

PART IV. AUTHOR AND SUBJECT INDEXES

Index of Authors 1062
Index of Subjects 1068
Index of Geographical Locations 1073

List of Periodicals ..... Cover 3